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VIEWS, NEWS AND INTERVIEWS.

Three youths in Buffalo, the other day, were standing right in the track of the electric car, coming along at a good pace, talking unconcernedly and oblivious of all the racket the motor-man was making with his bell and voice. The car was happily stopped without injuring the young men, but it was a close shave and shook them up considerably.

"What was the matter wid yez? Why didn't yez git out of the way?" demanded the policeman who picked one of them up almost fainting with fright.

"Why, you see," answered the poor fellow, with chattering teeth, "we all three had on our new red neckties, but we never had an idea they were so loud we couldn't hear the car. Honest we didn't."

Mr. Marsden J. Perry, of Providence, R. I., ex-president of the National Electric Light Association, is an ardent bibliophile and has a very large and fine collection of books.

Some interesting and rather surprising statistics on the use of the telephone in European countries have been collected. In London, the greatest commercial city of the world, only 1.5 persons in 1,000 use the telephone. The telephone is used most in countries where the service is owned or controlled by the State. In Germany, Switzerland, Norway and Sweden, from 100 to 400 persons in every 100,000 of the population are subscribers. In Great Britain, only 58 persons in 100,000 use the telephone. In Berlin 11, and in Paris 4.2 out of every 1,000 inhabitants use the telephone.

An electrical pool table is the latest electrical novelty. Contact buttons are so arranged in front of the pockets that when a ball rolls into the pocket it strikes the button and the point made is recorded by an annunciator on the wall of the room. The same principle has been applied to a pin-pool table. Push buttons are arranged in place of the pins on an ordinary pool table, and the balls passing over the buttons record the counts on the annunciator, and the score is kept automatically and accurately.

The telephone is pretty expensive, but you can call a man with it sometimes a great deal cheaper than you can at poker.—*Boston Commercial Bulletin.*

An interesting story comes from Grand Rapids, Mich. It is to the effect that Calvin Baldwin, a telephone lineman, who was stringing new wires on a pole, becoming chilled by exposure, took two drinks of whiskey to keep the cold out, and then returned to his perch near the top of the pole.

He had hardly reached his position when his comrades on the next poles noticed that he was acting queerly. They went to his assistance, and when they climbed up to where he was they found him drunk and in great danger of falling to instant death on the pavement below. He was so drunk that he could not climb down, and he declared that he would not, any way.

One man grasped him by the belt and held him by main strength for a quarter of an hour, while the other procured a rope. He was finally lowered to the ground with the rope around his body and taken home.

This makes a very good story, but it places Michigan whiskey in an equivocal position.

She dropped a nickel in a Tremont street electric car yesterday as she was endeavoring to hand it to the conductor. A man on her right gallantly stooped to pick it up. A man on her left bent low to perform the same gracious act. The conductor made a dive for his fare. There was a meeting of three manly heads and an ill-suppressed growl from three manly throats.

In the meantime the innocent little five-cent piece had rolled down toward the motor-man's end of the car, where it was rescued by a stiff-looking old gentleman who arose from his seat, stalked down to the lady and put it in her hand.

"You are very kind," she said, sweetly, and she gave the coin to the conductor. The men on her right and left looked as if they expected just a suspicion of an acknowledgement of their unhappy effort in her behalf, but they didn't get it.

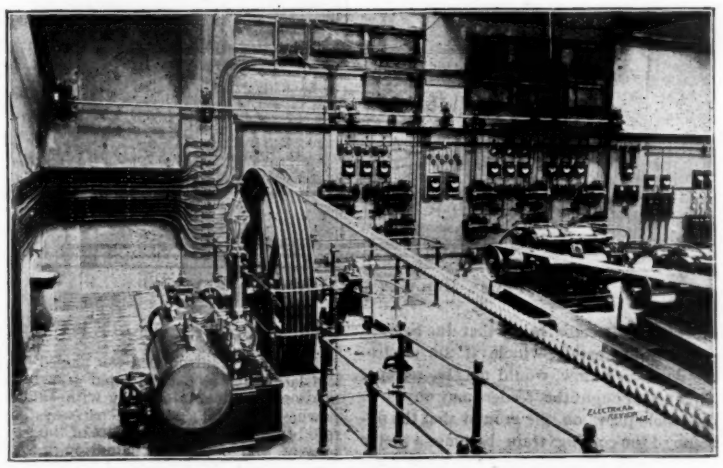
Such is electric car etiquette.—*Boston Herald.*

The Edison Injunction Dissolved.

Justice Barrett, of the supreme court of New York, has dissolved the injunction recently granted by him enjoining the Edison Electric Light Company from paying a dividend of 80 per cent. in trust debentures of the company. Referring to the opinion he expressed when he granted the injunction, he says:

I did not mean to be understood as asserting that a corporation could not, under any circumstances, distribute its surplus earnings through the instrumentality in part of bonds issued to represent such earnings. There may undoubtedly be circumstances which would justify such an expedient for temporary purposes. And, indeed, it might be made to appear that such bonds simply represented surplus earnings, and could not possibly impair the actual capital of the company. But I have not changed my opinion as to the scheme here sought to be begun. In my judgment the affidavit of defendant does not justify the issuing of these debenture bonds upon the collateral security of stocks and bonds of the subsidiary companies for the purpose of raising money to declare a dividend upon the stock of this defendant.

The relief sought should, he said, be found in a separate action.



Interior of Central Station at Lubeck, Germany.

Thomson Scientific Club.

C. J. H. Woodbury gave a lecture before the Club on Thursday evening, January 7, upon "Watchmen's Record Clocks."

The speaker called especial attention to the responsibilities imposed upon watchmen who are entrusted with the supervision of property against all hazards at night when all dangers are at their greatest.

Instead of procuring the services of robust men for such work, the men generally employed are those incapacitated for other work by reason of age, poor health or lack of a trade.

Watchmen differ from other employés in being absolutely alone in the performance of their duties, and this fact, that they are without companionship or supervision, renders them especially liable to the temptation to abridge, or, at least, be unsystematic in their work.

The various record clocks are designed to serve this needed purpose. Many years ago the only means for recording the patrol of a watchman was by the pin clock, in which wires operated by bell pulls depressed pins inserted in a disk in clockwork revolving once an hour; a complete circuit of the stations in a regular order, not varying more than five minutes at any one station, was necessary to drive a pin. This method was incorrect, because the clock was situated in the building to be protected and liable to be destroyed by a fire, and thus annul the record at the time when its evidence might be essential. It would not register independent visits, and the record of any visit was incomplete unless the full circuit had been made; and, moreover, the clock could be readily manipulated by a person of the average Yankee ingenuity, so that a full night's record could be made in a few minutes.

This was followed by the portable clocks of Hausburg, Buerk and Imhauser, where the record was made upon paper dials by chained keys placed in various parts of a mill. Some of the clocks of this type can be readily manipulated by false keys, but a proper inspection of the dials would indicate any sophistication.

The electric clocks were formerly very complicated and requiring frequent attention, and the expense was so great as to prohibit their use except in large establishments where the work of several watchmen could be recorded on the paper dials of a single clock.

The best type of clock is that using a single wire circuit with stations similar to a messenger call, and provided with mechanism by which an arbitrarily closed circuit will send electric impulses indicating numbers similar to that of a fire alarm, except that paper is perforated in numbers instead of ringing a fire alarm bell.

The annunciator system of electric clocks is cheap, efficient and satisfactory, and a later improvement of this system does not require any battery, but there is a magneto in every station which is operated by the watchman in the act of turning the key. It is impossible for such a clock to be manipulated except from a station, because there is no electricity in the system except during the act of turning the key at a station, and even if the clock were accessible, the latch of the clock door is so arranged as to perforate the paper dial whenever the clock door is opened or shut. A number of incidents were related bearing upon the misapplied ingenuity of watchmen in the means used to beat the clocks. There have been instances where persons have been employed as watchmen for years in a mill and falsely making complete records early in the evening, and then, after a night's sleep, working during the day in a cobbler's shop. Such unfaithful methods could not be used upon any of the electric record clocks.

Central Station at Lubeck, Germany.

The Lubeck, Germany, central station was built by Schuckert & Company, in 1886, and opened for work on July 19 of that year, with a capacity for furnishing current to 3,000 incandescent lamps of 10 candle-power and 100 arc lamps of four amperes.

The boiler room contains three tubular boilers, of the Heine type, furnished by the Borsigschen Machinenbau Anstalt. They possess a heating surface of 70 square metres and generate 20 kilograms of steam per hour and per square metre, at a pressure of seven atmospheres.

The dynamo and engine room is equipped with three horizontal condensing engines, furnished by the Nuremberg Machinenbau Aktien Gesellschaft. One of the engines is of 50 horse-power, and the remaining two are each of 115 horse-power. The cylinders of the large engines measure 380 millimetres and 570 millimetres in diameter, and have a stroke of 800 millimetres. The speed is normally 85 revolutions per minute, and with seven atmospheres pressure, develops 115 horse-power, although the same engines are capable of developing 200 horse-power if necessary.

The small engine has a stroke of 650 millimetres, and, with a speed of 85 revolutions per minute and seven atmospheres pressure, develops 50 horse-power.

The dynamos are of the Schuckert flat ring type and are compound wound. There are six machines of the above type in use, and each have a capacity of 42,000 watts.

The total length of cable used is 10 kilometres and the distribution is made on the ordinary two wire system. The greatest distance of any consumer from the station is 550 metres, and the drop in the main line is 15 volts, and of the branches, 15 volts.

Can Railway Collisions be Prevented?

To the Editor of Electrical Review:

Under a similar caption, your issue of January 2 contained a communication from the writer, asserting that the great mass of collisions *can* be prevented, and without dependence on human aid in any manner whatever.

I now take pleasure in sending you the accompanying sketches, which roughly illustrate the means by which such results can be accomplished in a manner which, everything considered, is quite simple.

Fig. 1 shows the cab and rear part of the locomotive, part of the structure being shown broken away to expose the devices used. In locomotive practice, the steam pipe from the valve chests passes back inside the boiler and up into the steam dome, when a double or balanced valve is arranged to admit steam from the dome into the said pipe. The valve or throttle is controlled by a lever and a rod passing back above the crown-sheet and terminating in the "throttle lever," which is always in the engineer's hand when the train is in motion. This lever is also connected with a powerful electro-magnet (as is also the usual air-brake valve, or a special brake-valve for the purpose) which is mounted in any convenient way. To the throttle valve rod is connected a supplementary small valve, controlling the admission of steam from a separate steam box in the dome into a small steam pipe leading to the steam chest of a small three-cylinder engine on the side of the locomotive, and directly connected to a small dynamo beside it. Both are shown of exaggerated size for clear illustration. They could be located anywhere on the locomotive, as determined by the master mechanic. The directions of motion of the two throttle valves are opposite, so that when the throttle lever is moved to shut off steam from the locomotive cylinders, the effect is, necessarily, to open the small throttle and admit steam to the small engine, thereby starting it up, and the dynamo begins to generate electrical pressure, and if a circuit is afforded, a current will circulate in such circuit. Now, there is nothing in all this which is impracticable, and any electrical engineer would guarantee the performance of such apparatus, especially if, as could easily be done, means are provided for maintaining the cylinders of the little engine at working temperature.

A complete circuit does not in the illustrations exist on any locomotive. Fig. 2 is a diagram in condensed form, showing the complete circuit established, when two locomotives get on the same block, and, at the instant when the moving locomotive completes the collision-preventing circuit. The engineer of the stationary locomotive has, of course, closed his throttle to stop his train. In doing so, he has, *without any volition of his own*, opened the small throttle and started the little engine and dynamo, and they continue to operate at full speed as long as that locomotive stands still on the track. As the center rail or wire is divided into blocks of any desired length, a half mile or a mile each, the circuit of the dynamo is open so long as no other locomotive gets on the same block. But the instant one does pass onto the same block, the dynamo circuit of the standing locomotive is completed, *through the apparatus on the coming locomotive.* That very instant, the current flowing up and through the throttle and brake magnets of the coming locomotive energizes them powerfully, and, simultaneously, steam is shut off and the air brakes applied, so as to stop the swiftest train in about its own length or little more. This, too, as in the former instance, is accomplished with certainty and without any volition or exercise of judgment or presence of mind on the part of the engineer of the approaching train.

Fig. 3 shows graphically a section of railway, a locomotive standing on the track, and a train approaching from up the line. The protecting "block" for the former begins at the point *a*, and until the approaching train reaches that point, nothing happens, but as soon as *a* is reached, no further progress is possible beyond the distance required for stopping.

Now, under such conditions, how is it possible for the approaching train to be in collision with the train standing on the track ahead? All ordinary cases are fully met by the apparatus above described. Special cases can be just as surely taken care of, and a heavily loaded train would be protected even though the rear brakeman were to trip and fall insensible ten feet from his train, and the operator at the last signal tower had been asleep when the second train passed. The whole thing is a simple problem in electrical engineering, once the idea is given; and I do not hesitate to say that the details can be carried out by any electrical engineer so as to unfailingly operate to the successful saving of life and prevention of damage to person and property.

It is not suggested as a substitute for existing methods of protection, but as an added safeguard, for I believe in utilizing every available help to secure the limbs and lives of railway travelers. The above scheme is susceptible of various modifications. It might be possible to make the "block" rail or wire continuous, and, by making it of a definite resistance, determine the protective distance by the strength of current. A given number of amperes being required to pull the throttle magnet, this current would be attained in the circuit only after the approaching train has sufficiently reduced the track resistance to permit the current to rise to the required point. Under some conditions this could be done with great exactness, the only error being that due to leakage in wet weather, which, if the electromotive force be low, would not be serious.

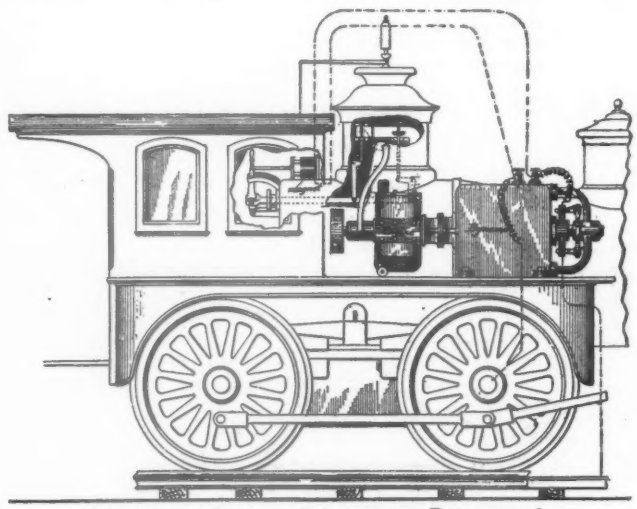


Fig. 1.—Can Railway Collisions be Prevented?

At first thought the reader may object to the whole plan, on the ground that the dynamo of the coming train becomes a motor on admission of current and will nullify the effect on the operating magnets. But on further study he will probably abandon the objection, especially seeing that such dynamo is directly coupled to the little engine and can't rotate till the engine gets steam, which cannot take place *till the magnets operate.* Even this unnecessary admission of steam can be prevented by a simple arrangement.

T. J. McT.

New York, January 16, 1892.

Brooklyn and the Trolley System.

The Brooklyn board of aldermen, on the 11th inst., again adopted a resolution granting to the street car companies the right to use the trolley system of electric propulsion. This action was taken at the request of the railroad companies, in order to avoid legal complications liable to arise should they assume that the previous resolution had become an ordinance owing to the failure of Mayor Chapin to act upon the same.

The recent action of the State Railroad Commissioners in granting the Brooklyn and Coney Island Railroad Company and the Brooklyn City and Newtown Railroad Company permission to use electricity instead of horses is supposed to indicate that a similar permission will be given the two other companies, Brooklyn City and Atlantic Avenue, whose applications are on file.

Mayor Grant's Message.

Mayor Grant's annual message to the New York board of alderman, presented recently, contains the following items of interest to electrical people:

RAPID TRANSIT.

Acting under the provisions of chapter 606 of the laws of 1875, in the month of December, 1890, I appointed William Steinway, John H. Starin, Samuel Spencer, John H. Inman and Eugene L. Bushe as commissioners of rapid transit.

Experience had demonstrated the fact that the provisions of the act of 1875 were not of such a character as to permit the construction of any permanent system of rapid transit in this city. The municipal authorities had presented to the legislature at its session in the year 1890, an act giving additional powers to those conferred by the act of 1875, under which a proper system of rapid transit could have been laid out, but the Republican legislature refused to pass such bill, and the solution of this important matter was thereby delayed for another year.

The same legislature, however, recognized the propriety of such a bill by causing to be introduced and attempting to pass a bill conferring substantially the same powers, but which latter bill violated the principle of home rule by taking the appointment of the commissioners and the management of the work out of the hands of the people of this city.

The legislature having thus committed itself to the general features of the bill promoted by the municipal authorities, they, at the opening of the session of 1891, caused to be introduced a bill adopting the essential features of the one thus approved at the previous session, and making the commissioners that had been appointed by me in December, 1890, commissioners under the provisions of such act.

The act thus introduced was passed by the legislature and a board of rapid transit commissioners came into being with sufficient powers to lay out a comprehensive system of rapid transit meeting the needs of the city at present, and capable of extension in the future to meet its anticipated growth. The commission has proceeded with the utmost diligence under the terms of the act. After giving careful and laborious attention to every suggested means of rapid transit, it submitted to the common council on the 20th day of October last a comprehensive underground system of rapid transit, which met with the general approval of the public and the almost unanimous commendation of the press. The line is located up Broadway to Fourteenth street, and thence by diverging lines to the east and west, reaching the largest centers of population least provided with rapid transit facilities. The report was promptly approved by the common council in accordance with the provisions of the act, and thereupon the rapid transit commissioners proceeded to obtain consents to the building of the road. A very large number of consents have been obtained, but owing to difficulties arising from the fact that many pieces of property along the route are held by owners who are absent from the city, or by trustees without power to give consents, and that many owners fear they may be waiving some rights if they sign the consents, and from other causes, the commissioners, as I am informed, have not yet been able to obtain the consent of the majority of the owners along the line of the proposed route. It is, therefore, necessary, for the purpose of saving time, that advantage be taken of the provisions of the act authorizing an application to the general term of the supreme court to have that court determine, on report of a commission to be appointed by it, whether the proposed railway ought to be constructed and operated. Such application will doubtless be presented at the February general term of the supreme court, and if that court, on the report of its commission, determines that the road ought to be built and operated, such determination takes the place of the consent of the property owners along the line, and the franchise for the proposed railway should be ready for sale at public auction, in accordance with the terms and provisions of the act, in the coming Spring.

The subject of rapid transit for the annexed district is important in aiding its development. For its surface roads I favored the trolley system as being peculiarly adapted to its needs. The people of the Twenty-third and Twenty-fourth wards are at a disadvantage in their facilities for rapid transit which their geographical position does not justify. The elevated railroads of New York now extend on the west side of the city to 155th street. A great part of the population of the Twenty-third and Twenty-fourth wards is south of the line of 155th street. While the people of the west side are now enabled to proceed from their residences to their places of business in one railway by the payment of one fare, the people of the annexed district are compelled to patronize two different lines and pay two fares. When the proposed line of railway laid out by the rapid transit commissioners is built these difficulties will be remedied. In the meantime, however, the situation must be considered and other means devised to place the people of this district on an equal footing with the residents of the lower side of the Harlem river. The returns to the Manhattan Elevated Railroad have been considered sufficient in the past to secure, by the voluntary action of that corporation, a uniform maximum rate of fare for the entire length of any of its routes of five cents. It is to be hoped that the same line of policy may lead that corporation and others owning independent lines and interchanging traffic within the limits of the city to adopt a similar rate for the entire length of their combined routes, making a just apportionment of fares based upon considerations of the greater advantages to the lines operated in the center of the city over the suburban routes.

THE WIRES UNDERGROUND.

The decrease in fatal accidents resulting from overhead wires, despite the great increase of electrical business, is an evidence of the wisdom of the efforts made by this administration to place the wires underground. One fatal accident, in which death was caused by a fall from a telegraph pole, is the record of the year. In 1889 five deaths from actual electric shock were reported. There has also been a noticeable improvement, especially in the lighting service, from the use of the subways. The year's work under the Board of Electrical Control comprises the removal of 5,224 poles and 7,152¼ miles of wire and the construction of 114 miles of subways. The capacity of this subway work is as follows: 47 miles for electric light service, 721 miles for telephone and telegraph service, and 121 miles for Edison light service. There are now in use in the city 1,420 miles of subways, divided as follows: Electric light subways, 578 miles; telephone and telegraph subways, 721 miles; and Edison subways, 121 miles. There are at present 59 alternating and 84 arc circuits, making a total of 143 high tension circuits in use in the subways, with 528 miles of electric light conductors. There are 29,666 miles of telegraph and telephone wires, and 383 miles of Edison conductors. The reports are conclusive that, from an electrical standpoint, the operation of the subways is a success.

A MUNICIPAL TELEGRAPH EXCHANGE.

I would recommend the establishment of a municipal telegraph exchange to connect the departments and other points between which communication is necessary and desirable. This service is now performed by several independent and inadequate systems, each department having its own, without uniformity of plan or of efficiency. All the departments should be connected by wire, with a central station controlled by the city government, in which the city's operator could connect any two wires called for, as in the switch plans of the telephone exchanges. Each office should be provided with either a dial telegraph, a ticker, or other instrument, which would transmit the messages as rapidly as written. The expense would be very light, as the city owns privileges in the use of the subways.

The advantages of a single system by which any official could reach any point would greatly facilitate the transaction of the business of the city and add to the efficiency of those departments whose duties involve the protection of life and property. The points to be connected might well include the Police and Fire Department buildings, the public offices and the hospitals. It might be found desirable to throw open these facilities to the public, to the extent of permitting theatres and other places of public resort to be connected with Police and Fire Headquarters at a charge which would pay the expense of the service and yet be much lower than similar service now costs.

Important Litigation on Insurance of Central Stations.

Litigation of great importance to electric lighting interests has been in progress before the superior court at Salem, Mass., during the first portion of the month.

The facts in the case, which we understand to be fully admitted by both parties, are, that the electric light station at Lynn, Mass., was the victim of a disaster on October 26, 1890, between 1.30 and 1.45 A. M., in which the fly-wheel of a 500 horse-power compound Corliss engine burst, wrecking a large portion of the station and injuring other buildings in the vicinity. Pulleys were broken, and the main shafting strained in such a way as to break one of the masonry piers supporting a journal bearing. A slight fire also occurred in the wire tower upon the top of the station. According to the testimony of the four men on duty in the station at the time, the engineer was away from the engine and in a distant part of the station, the fireman was in the boiler house, and the other two men near to some of the dynamos. When the engine began to race, the watchman tried to shut off the steam, but was struck by one of the pieces of iron flying around the room, and barely escaped with his life. The other men saw sparks dropping from the open manhole leading to the wire tower, and the engineer pulled a fire alarm box outside of the building.

The fire department came promptly, and supposing that their services were required only on account of the wreck, there not being any appearance of fire, there was some delay in bringing the apparatus in service, but at this late time, the fire was extinguished by one of the firemen with two-thirds of the contents of a chemical fire extinguisher.

Another point upon which all parties are agreed is the amount of the damages as fixed by two appraisers as being $1,134 for the fire and the chemicals used to extinguish the same, and $7,608.05 for the breaking of machinery and injury to building, caused by flying pieces of iron.

This statement of facts, as mutually admitted by both sides, leads to the point at issue causing the suit.

The circumstances being such that there was not any opportunity of precise observation respecting certain salient points bearing upon the disaster, necessarily made certain important elements purely of a conjectural nature, and the lack of direct evidence was supplemented by abundant expert testimony on both sides.

The theory of the plaintiff electric light company was that a fire occurred in the wire tower; and they conceded that it was probably caused by a cross arc, and, they claim, in turn the flames heated all the lightning arresters, until the wings met and short-circuited two Thomson-Houston arc dynamos carrying 95 lights, and the first impulse of building up the fields before the regulator could operate caused such a mechanical shock to the machinery, and that the pull of the belting driving the two dynamos collapsed one of the pulleys on the main shaft, and that a piece of this pulley was thrown in such a manner as to knock off one ball of the governor and cause it to lose all further control of the engine, thus completing the wreck already begun.

The plaintiff also advanced the theory that a piece of the jack pulley was drawn under the fly-wheel of the engine, raising it in such a manner as to add to the work of destruction; all of which it was claimed proceeded from the small fire in the tower, and all of which came within the liability of the policies of insurance.

The defense, on the part of the 23 defendant insurance companies who have issued policies on the property, declare that they are ready and willing to pay the full measure of all damage to building and contents by fire, and also the further injury done by the chemical fluid used in extinguishing the fire, but they claim that the fire was a result and not a cause of the whole disaster, and that their liability is limited to the smaller amount of $1,134; and that the remainder of the damage proceeded from antecedent or independent causes, and therefore was not within the liability of their policies.

The theory of the defense, as developed by the testimony introduced on behalf of the insurance companies, is that the governor lost control of the engine through the failure of its governor belt which either broke at the lacings, or that the stretch of the belt had not been taken up so that it would slip, and that it was a simple case of a runaway engine. A portion of the governor was in line with the fly-wheel and probably maimed by a piece which broke from the fly-wheel when the destruction took place. It was held that the fly-wheel reached a velocity of over four times its normal rate before bursting, and that one of the results of this great speed increased that of the dynamos from 845 to about 3,400 revolutions per minute, and imposed conditions far beyond the capacity of the Thomson regulator to limit the rise of the electromotive force to such an extent as to overcome the resistance of the insulation in the tower, especially as the wood-work must have been necessarily damp and its resistance impaired by continuous stormy weather, which prevailed for four days preceding the occurrence. And that for these reasons they were not liable for any of the losses which they maintained were antecedent to the fire.

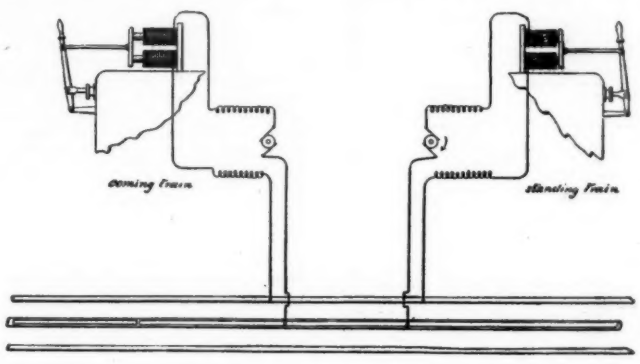


FIG. 2.—CAN RAILWAY COLLISIONS BE PREVENTED?

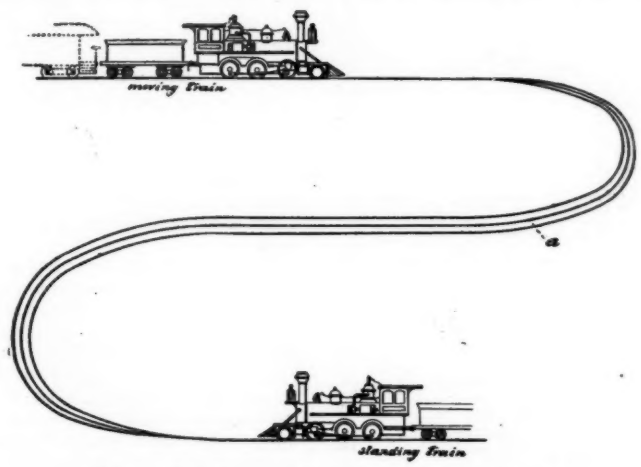


FIG. 3.—CAN RAILWAY COLLISIONS BE PREVENTED?

A peculiar feature of the suit was, that the case as presented by the electric light company, claimed that there were limitations to the operation of the Thomson governor in maintaining constant current under sudden changes in the resistance of the external circuit. On the other hand, the expert testimony on the part of the defendant insurance companies declared that the Thomson governor was a most efficient regulating device, and save at the instantaneous impulse, at short circuiting it would maintain a constant current under all conditions of use, even to short circuiting the machine, and that it would also operate to preserve a constant current throughout such changes of velocity as might be due to a badly regulated engine, but that it would not serve its purpose when the dynamo was running at four times its normal speed.

The jury listened with strict attention to this case from Wednesday morning to the Friday noon of the following week, when Judge Hammond gave the case to the jury, who were out for the remainder of the day and throughout the following night, until Saturday morning, when they gave a sealed verdict as the court did not sit on Saturday, and this verdict, on being opened on Monday morning, January 11, proved to find for the electric company to the full amount as claimed.

The counsel for the defense moved for a new trial, and the matter will be carried to the supreme court on exceptions before it will be finally settled.

The trial abounded in technical points, pertaining to the applications of electricity to illumination and to the methods of practice in operating central stations, and was conducted with great ability on both sides by the able counsel engaged in the case, but this litigation is of great importance to other parties than those represented in the case, and that is the great electric lighting interests and their relations to the insurance upon such propery.

It is claimed that in resisting this suit the insurance companies do not wish to evade paying a single cent of the amount justly due, and that the amount of the damage to the electric light station is agreed to by both parties; but they do not consider that a certain portion of the damage comes within the liability of their policies, as a contract of indemnity against fire, and that they are not warranted in paying for that portion of the damage until the question is finally settled by judicial decision. These questions of proximate hazard have been very thoroughly decided, especially by English courts, but this case, in its dependence upon facts pertaining to matters connected with the generation of electricity, is without precedent, and therefore of great importance.

Colorado Springs, Colo.—The Coalmiln and Durango Development Company; capital, $250,000.

Marshall, Ill.—Marshall Electric Company; capital, $20,000. Promoters, Emma Ewalt, Annie J. Travis and C. C. Travis. Incorporation papers sent to C. C. Travis, Shawneetown, Ill.

Montgomery, W. Va.—Montgomery Electric Light and Power Company; capital, $50,000. Promoters, T. B. Davis, J. W. Montgomery, J. C. Montgomery, O. L. Montgomery and Seth Montgomery. Incorporation papers sent to Brown & Jackson, Charleston, W. Va.

Paris, Tex.—Paris Electric Light and Railway Company; capital, $300,000. Promoters, S. J. Wright, J. J. Walsh and John Martin. Incorporation papers sent to J. J. Walsh, Paris, Tex.

Gravesend, Coney Island, N. Y.—Edison Electric Illuminating Company of Coney Island; capital, $50,000. Promoters, Manuel A. Plaisantin and Josephine V. Cook, both of Brooklyn, N. Y.

Charleston, Mo.—The Charleston Electric Light Company; capital, $6,000. Promoters, S. Alexander, A. H. Danforth, A. Orr. Incorporation papers sent to J. J. Russell, Charleston, Mo.

Cortland & Homer, N. Y.—The Cortland and Homer Electric Company; capital, $50,000. Promoters, C. B. Hitchcock, Tallapoosa, Ga.; F. B. Hitchcock and H. Wells, of Cortland, N. Y.

Dixon, Ill.—Dixon Power and Lighting Company; capital, $75,000. Promoters, F. W. Watson, A. C. Bardwell and F. A. Truman. Incorporation papers sent to A. C. Bardwell, Dixon, Ill.

Castle, Mont.—Castle Electric Company; capital, $50,000. Promoters, John L. Fraser, Hanson H. Burnes, Nahum T. Dinsmore, George E. Simon and Charles E. Miller, all of Castle, Mont.

Greensburg, Pa.—Westmoreland Electric Company; capital, $50,000. Promoters, Daniel Monahan, E. H. Bair, J. E. McFarland. Incorporation papers sent to Beacom & Robinson, Greensburg, Pa.

Kirksville, Mo.—The Electric Light Company of Kirksville; capital, $15,000. Promoters, J. Caskey, S. M. Pickler, J. C. Carothers. Incorporation papers sent to Jno. L. Porter, Kirksville, Mo.

Davenport, Ia.—Davenport Power and Light Company; capital stock, $50,000. Promoters, Wm. L. Allen, Thos. O. Swiney, B. E. Sunny, Henry S. Manning, Jas. S. Cumings, all of Davenport, Ia.

Logan, O.—The Logan Electric Light Company; capital, $20,000. Promoters, John Hansen, John F. White, J. A. Stiers, W. W. McCray, F. S. Case. Incorporation papers sent to John Hansen, Logan, O.

Troy, Pa.—Troy Electric Light and Power Company; capital, $10,000. Promoters, B. B. Mitchell, Daniel Fletcher, Jno. Parsons, Frank Loomis, A. C. Fanning. Incorporation papers sent to A. C. Fanning, Troy, Pa.

North Baltimore, O.—The North Baltimore Electric Light and Power Company; capital stock, $50,000. Promoters, A. S. Henry, W. S. Corn, W. H. McMillen, L. Wooster, D. E. Peters. Incorporation papers sent to W. H. McMillen, North Baltimore, O.

Butte, Mont.—The Montana Mining, Loan and Investment Company; capital, $12,000,000. Promoters, Henry L. Haupt, Harry C. Kessler, J. E. Richards, H. G. Valiton, John F. Cowan, P. A. Largey, M. L. Holland, Chas. J. Stevenson, all of Butte, Mont.

Duquesne, Allegheny Co., Pa.—The Duquesne Heat, Light and Power Company; capital, $20,000. Promoters, William B. Rath, M. G. Conlin, C. W. Allbrand, H. T. Black. Incorporation papers sent to J. R. McQuaid, 158 Fourth ave., Pittsburgh, Pa.

Decatur, Ill.—City Electric Railway Company, of Decatur, Ill.; capital, $300,000. Promoters, D. S. Shellaberger, James Milliken, B. O. McReynolds, W. H. Starr, I. R. Mills, D. W. Bronnaman and W. L. Ferguson. Incorporation papers sent to Shellaberger Mill and Elevator Company, Decatur, Ill.

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NEW YORK, JAN. 23, 1892.

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There seems to be a quite general impression in Brooklyn that Mayor Boody will not veto the recent resolution of the Board of Aldermen re-adopting their previous resolution granting the street railroad companies authority to use electricity instead of horses for motive power.

The message of Mayor Grant, of New York, this year contains much that is interesting to the electrical fraternity and shows very encouraging results of the placing the wires underground in this city as far as the electrical features are concerned. The rentals of subway duct, however, are entirely too high, not to say unreasonable, and must in justice be reduced.

The Mayor suggests a municipal telegraph system connecting the various city departments, hospitals, etc., in order to facilitate communication between them.

The idea is a good one, and would save much time and expense in carrying on the work of the city government.

The National Electric Light Association is asking its members if they want an exhibition at the Buffalo convention. If an affirmative reply is forthcoming it is understood that ample and satisfactory arrangements for an exhibition can be made.

The Providence *Journal*, one of the few daily papers which devotes any intelligence to the handling of electrical news, copied our recent article on the prevention of railway collisions, with the following comment:

"It is gratifying to observe that the fatal disaster on the New York Central road at Hastings is having its effect in stimulating discussion at the necessity of using the best obtainable methods of signaling. There is a general and well-founded belief that the block system does as much as human ingenuity can do to prevent those rear collisions which have become, of late, all too frequent. In the current number of the ELECTRICAL REVIEW, however, a correspondent, whom the editor vouches for as an able, practical engineer, suggests electrical devices to supplement the working of the block system and make it even more reliable. His letter is so full of interest that it deserves reprinting in full."

The recent decision of the New Jersey supreme court interpreting the State statute relating to street railways in the cases of the Newark and Trenton roads, will prove a serious set back to the introduction of electric street railways in New Jersey unless the legislature changes the law. According to this decision every man who owns a foot front on a street can set at naught the desire of the majority and interpose a simple objection which, as the law now stands, it is impossible to overrule. Public sentiment, however, is practically unanimous in favor of the electric railway and, as the legislature is now in session, the matter will probably be brought up and the obnoxious statute changed to something more suitable to the times and in accordance with the progress of the country at large. Newark has had a large and satisfactory experience with the use of electricity for street car propulsion, and is loudest in its call for a better law. We have no doubt she will get what is asked for.

INSURANCE OF ELECTRICAL RISKS.

A very important case relating to the liability of insurance companies was decided in the superior court of Massachusetts, at Salem, on the 11th inst. A full account of details of the suit is given in another column.

The question involved was, how far the responsibility of an insurance company extends in connection with its fire risk—where shall the line be drawn? In this case, according to the theory of the central electric light station company, at Lynn, a fire occurred in their wire tower caused by a cross arc; this occasioned a short circuit of the circuits of two arc machines, and this in turn, by throwing such a sudden and unusual load on the main shaft pulleys, caused one of them to break, a piece of the same striking the engine governor, carrying away one of the balls. The wreck was then completed by a racing engine and the bursting of its fly-wheel.

The insurance companies claim that the governor belt broke, or stretched, and that the engine raced, causing an excessive electromotive force in the line, the insulation gave way in the tower and the fire occurred. The electric company won the suit, but the case was appealed.

If the decision finally stands in favor of the defendants, then the position of the insurance companies is sustained and the cost of insurance of electric lighting stations will remain substantially as before, but we fear that a decision against the companies would define a new measure of liability and increase the rates of insurance on such property.

Insurance is merely a system of taxation upon the many for the losses of the few, and capital will not remain in the business of insuring any class of property, unless it can be done at rates which will sustain it without impairment. It is a serious question whether it would not be better in the long run, to eliminate such an uncertain risk from the fire hazard.

THE PROGRESS OF THE PAST YEAR.

In the electrical world we are more prone to look forward rather than backward—to look up the stream, not at the waters of achievement that have flowed past.

This, owing to the bewildering rush of tasks accomplished, leaves us but scant time to review what has been done. A year—yes, six months—is an age in the history of electric work in our day, and no one now dare say nay to the most daring prediction. The past year has been big with important events, and a glance back at them cannot fail to be instructive.

The incandescent electric lamp question has been practically settled. The mileage of electric railways in operation and projected has increased fourfold over that of any previous year in the history of electric traction; gearless railway motors have been introduced, as well as the so-called "ironclad" motors. A very notable event has been the issuing of the Green fundamental railway patents.

Perhaps the most novel and interesting of the developments of the year are the experiments of Nikola Tesla with currents of high frequency, which point to the possibility of producing light without wire connections to the glow lamp and flame from the bare end of a conductor. This, with a current of many thousand volts, yet not dangerous to life.

The successful transmission of power between Lauffen and Frankfort, Germany, a distance of 108 miles, opens up a vista of great results in the near future in the field of power transmission.

The ancient question of the priority of storage battery patents in this country has been settled favorably to the Brush Company.

Aluminum obtained by the aid of electricity is now, owing to recent great improvements in the modes of manufacture, a practical commercial product, selling at a price which insures its adoption for numerous uses where silver and nickel has heretofore held undisputed sway.

The telegraph service has greatly increased its efficiency and reduced its average rates.

Immensely popular has the long distance telephone become, until it has approached the point where it is a necessity rather than a luxury.

The telephone patent issued to Emile Berliner on a telephone, was the event of the year in the field of telephony, owing to its important bearing on existing patents.

Immense strides have been made in subway work throughout the country and a more satisfactory service is the result, although the expense has been a most dampening factor in its advancement. It is hoped that experience will greatly modify this drawback.

The new inventions in all lines of work that have been made are most numerous and in the coming year we shall see many put into practice.

As far as the business in general is concerned, we can chronicle the most favorable results. Securities have become more stable, competition, although severe, is more reasonable, and the day of wildcat prices has passed. The electrical industries of all kinds are conducted on conservative business principles.

Take it all in all, the past year has been more fruitful of good results than any previous year.

La grippe has recently proven its entire fearlessness of the mysteries of the *deadly electric current* and has bearded the lion in its very den. Many of those past masters of the shrine at Lynn are struggling in its uncanny embrace and the names of Thomson, Van Depoele, Rohrer and others well known in the realms of electricity, have proven no talisman against this arch fiend. Verily, the sneeze and cough of this foreign visitor is heard even in the halls of the electric soothsayers.

It seems, from recent trials by jury in New York, that the question of conscientious convictions against capital punishment is much less prominent than ordinarily in selecting juries in murder cases. The question of prejudice against electricity as a mode of execution appears more prominent, however, many talesmen being excused, owing to the existence of such a feeling.

CORRESPONDENCE.

OUR ALBANY LETTER.

The Work of Wiring the Masonic Home at Utica, N. Y., for electricity has been completed.

Sherman, N. Y., will have electric lights within two months. The subject of electric lighting is also being agitated in Randolph, N. Y.

The New Engine of the Utica, N. Y., Electric Light and Power Company, is nearing completion. Besides the engine, $8,000 worth of new shafting and pulleys is being put in.

The Troy City Railroad has elected the following directors: Lewis E. Gurley, Levi Smith, James O'Neil, Peter McCarthy, E. Ogden Ross, Anthony N. Brady, Edward Murphy, Jr., William Kemp, Charles Cleminshaw, Joseph J. Hagen.

E. A. Fitzgerald, electrical inspector of the Underwriters' Association, State of New York, was in Cambridge, N. Y., recently, inspecting the electric light plant. He found everything satisfactory and gave the company considerable practical advice, to reduce the danger of fire and loss of life.

The Troy and Lansingburg Railroad Company has chosen the following directors: William Kemp, O. G. Clark, Charles Cleminshaw, U. B. Powers, J. B. Carr, Francis N. Mann, Jr., C. W. Tillinghast, Shepard Tappen, D. B. Dauchy, Edward Murphy, Jr., John O'Neil, Peter McCarthy and Thomas Breslin.

Elmer Z. Burns, electrical engineer, formerly of Lockport, N. Y., and recently of New York, has formed a partnership with H. W. Beardsley, architect, at Niagara Falls. Mr. Burns, has been employed by the Mather Electric Company, the United States Electric Company and is consulting engineer for several large electric power companies.

It Is Rumored that the stockholders of the Ogdensburg, N. Y., Street Railway Company, are making arrangements for electric street cars. It is said that an offer for the road has been made by one of the large electrical companies, either to buy outright or lease for a number of years. Whether this offer is accepted or not the officers are considering adopting electricity as a motive power.

The Utica, N. Y., Electric Light Company has elected the following directors: H. D. Pixley, R. T. McDonald, J. F. Blant, T. Solomon Griffiths, M. Jesse Brayton, Wm. E. Lewis, H. M. Schenck; inspectors of election, W. K. Harvey, John Doyle and W. K. Roberts. The directors elected these officers: President, H D. Pixley; first vice-president, R. T. McDonald; second vice-president, William E. Lewis; secretary and treasurer, M. Jesse Brayton.

The Utica, N. Y., Belt Line Street Railroad Company has elected the following directors: William E. Baher, Boston; Winthrop Coffin, New York; Thomas H. Farley, New York; John W. Boyle, Charles W. Mather, Charles B. Tefft and William W. Cole, Utica. John H. Grant, Thomas P. Weston and Edward Bushinger, were election inspectors. The board of directors organized by electing W. E. Baher, president; J. W. Boyle, vice-president; G. E. Tripp, secretary; and Winthrop Coffin, treasurer. Messrs. Baher, Boyle and Coffin, were named the executive committee and Messrs. Mather, Farley and Tefft, the auditing committee.

The Postal Telegraph and Cable Company has opened an office at Herkimer, N. Y., which will be run in connection with the Adirondack and St. Lawrence Telegraph Company. The superintendent of the latter company is Mr. H. J. Edson, who was formerly Dr. Webb's private operator at his home on Shelburne Farms. The Adirondack line is in operation as far as Poland, and it will soon be extended to Malone. Messrs. Clark Bros., of Belmont, have completed the contract with Messrs. Healy & Son, tanners, at Wellsville, N. Y. An electric light company, with John McEwen and W. C. Ross at the head, will give Wellsville an electric light system.

The Ellenville Electric Company, of Ellenville, Ulster county, N. Y., has been incorporated. Its objects are to manufacture and use electricity for producing light, heat and power, and to store, conduct, transmit, supply and sell the same, and to purchase, hold, use, supply and sell any and all franchises, rights, materials and appliances which may be used in the manufacture, supply and use of electricity for the purposes indicated. The capital stock is $30,000, consisting of 600 shares of $50 each. The directors are: John A. Kemp and John B. Murray, of Delhi; and Edwin P. Russell, of Ellenville. Electrician J. C. Abbott, of the Jarvis-Conklin Trust Company, has been in Schenectady, N. Y., examining the street railway system. The Jarvis-Conklin company builds electric roads, and Mr. Abbott is investigating the Edison system. The Edison Electric Company, of Schenectady, will probably get some large orders from the Jarvis-Conklin Company. L. M. W.

Albany, January 16.

OUR CHICAGO LETTER.

Mr. Harry Woodward, general manager Peoria Electric Railway, was in the city this week.

Isaac Kinsey, general manager of Post & Company, Cincinnati, Ohio, is in the city on business.

Mr. A. Johnson of the Brooklyn Electric Railway, Cleveland, Ohio, is among the recent arrivals this week.

Prof. Sidney Short of the Short Electric Railway Company, Cleveland, Ohio, is one of the many in the electric business visiting Chicago this week.

Colonel Sinclair of the Galveston City Railway Company, Galveston, Texas, is here this week and reports business very good for this season of the year.

Mr. John H. Reid, formerly with Wagner & Reid, manufacturers of electro-medical appliances, has sold out his interest and is now connected with the Edison General Electric Company, Chicago.

Captain Hall, president Fort Clark Street Railway Company, Peoria, Ill., was among the recent visitors to Chicago this week. It is proposed by the above company to change their power to electricity in the near future.

Mr. L. E. Myer, recently with the Calorific Heating Company, has joined the forces of the Detroit Electrical Works, Detroit, Mich. Mr. Myer will act as their Chicago representative, with temporary quarters at 431 the Rookery.

George Cutter went East last week and took with him two orders for 1,000,000 feet each of Simplex wire. Mr. Cutter has sold 300 miles of this wire for use in Chicago within the last two months. He will, no doubt, meet with a royal reception at the hands of the Simplex people upon his arrival.

At the Meeting of the Chicago Electric Association, held Tuesday evening, at St. George's Hall, on Washington street, Mr. Conner, of *Electricity*, presented a paper on "Technical Journalism," and was followed by remarks by Mr. Hickok, of the Western Electric Company. Subject, "Dynamo Regulation."

Prof. John P. Barrett, of the city electrical department, returned to Chicago this week, after a short visit to New York, and denounces the much circulated rumor that the New York municipal authorities were trying to secure his services to establish a police patrol system there, such as used here, as being false. Mr. Barrett says that under no circumstances could he be induced to leave Chicago. M. J. B.

Chicago, January 16.

OUR BOSTON LETTER.

The Eastern Electric Supply Company, of this city, has kindly presented this office with a very pretty calendar.

The Boston Electric Club held the first of its monthly dinners for 1892, at the Parker House, Monday evening, January 11.

Mr. Fred. H. Gardiner, formerly superintendent of the R. I. Telephone and Electric Company, has accepted a position at the Boston headquarters of the New England Telephone Company.

Erie Telephone Company's sub-companies made a net gain of 88 subscribers in December, making 278 for the quarter ending December 31, and 863 for the year 1891. Total number connected December 31, 14,011.

Mr. George Albree has been appoined superintendent of the Boston and Suburban division of the New England Telephone Company to fill vacancy created by promotion of Mr. William J. Denver to the assistant general management of the company.

Marine Electric Light Plant.—The steamship "Fairfax," of the Merchants' and Miners' Steamship Company, of Boston, has been equipped with an isolated electric light plant having a total lighting capacity of 250 sixteen candle-power incandescent lights. This installation was made by the Thomson-Houston Electric Company.

A New Syndicate of stock companies will soon be formed to write electric station risks. This syndicate will operate under the title of the Electric Fire Insurance Association and comprises the following companies: Home, Niagara, American, of New York, Greenwich, Pennsylvania, Fire Association of Philadelphia, Guardian, of London and Providence-Washington. Other large companies have been invited and some may join, though the Association is now prepared to take all the business offered. The risks taken will be equally distributed among the associated companies, the policies whether taken by the Association direct or otherwise, will be written by the local agents of each company in the place where the risk is located and the agent will get his commission. The office of the Association will be transferred to New York at an early day and the business will be conducted by Mr. S. E. Barton as manager. W. I. B.

Boston, January 16.

EMINENT ELECTRICIANS.

FACTS ABOUT FAMOUS MEN WHOSE NAMES WILL ADORN THE ELECTRICITY BUILDING AT THE WORLD'S FAIR.—BY DR. P. H. VAN DER WEYDE.

VIII.

Henry—Joseph (1797–1878); American physicist. Studied in the Albany academy, and at the age of 29 was appointed as professor of mathematics in his *alma mater*. He then made some experiments in electricity and published a description of various improvements in electro-magnetic contrivances. He was the first to prove that the English physicist Barlow was mistaken when he found that electro-magnetic attraction could not be transmitted to a distance (see biography of Morse, ELECTRICAL REVIEW for December 19, page 235). He made the first electro-motor in the United States, and the first large electro-magnets ever made anywhere in the world. This he did in the college at Princeton, N. J., where he soon was called as professor of physics, and where his large electro-magnets are still to be seen. Each of them can carry 3,000 pounds, and this by means of a battery of only one cubic foot in dimensions. They were first exhibited in the Albany Institute in 1829, and the writer vividly remembers the sensation produced in Europe when the news reached there, also the experiments made to verify this, and the surprise that these magnets of iron put even the strongest steel magnets in the shade. The writer had made for himself, a few years later, two such magnets in horseshoe form of Norway iron, of 60 pounds each; as there was no copper wire then to be had, he coiled them with strips cut from sheet copper, insulated between the different layers by old silk wrappings; he charged them with a single flat cell of one square metre surface, and found Henry's discovery fully confirmed. Then came the news in Silliman's Journal in 1831, that Henry had transmitted signals such as the ringing of bells at a very great distance. In 1833 he demonstrated before his class in Princeton, that messages could be transmitted by an electric current to great distances, and so laid the complete basis for the practical electric telegraph later introduced by Morse. In 1837 he went to England and explained to Wheatstone his method of producing signals at a great distance and even to ring a church bell 100 miles off by an electro-magnet.

No wonder that after the important things he had accomplished he was chosen as the president and secretary of the Smithsonian Institution in Washington, with full powers of directing its affairs, which he did until his death. He published many papers in the different scientific periodicals, most of them on electricity and magnetism. The personal recollections of the writer, concerning his frequents visits to the Smithsonian Institution during Professor Henry's life, belong to the most delightful of his life long experiences. His amiability and modesty were an example for all who, by good luck combined with talent, have been placed in a well deserved lofty scientific position.

I will mention only one case as an example of his character, as it illustrates his generosity, amiability and modesty at the same time.

When I met him at the beginning of the Franco-Prussian war, he exclaimed, "I am very glad that you came just now, because I have received a large lot of acoustic apparatus from Kœnig in Paris, and as I know how well you are posted in this branch as well as in music, I wish you to help me unpack them; there may be novelties with which I am not yet acquainted." Of course, I agreed, and said that I felt only too happy to be of any service to him, and then during the opening and unpacking he told me the circumstances which induced him to give so large an order for acoustic novelties.

Kœnig came to him and explained his great misfortune. He said that the threatened invasion of the Germans had totally ruined his business in Paris, and that he had saved his property in apparatus by sending it all to London. He tried to sell it there, but did not succeed, and as a last resort he came to him asking for an advance payment of $1,000 (I do not remember the correct amount), promising to send him from London the full money's worth, if not more than the sum requested. Professor Henry's sympathy was aroused, knowing the merits of the man and what he had done for the progress of science. Professor Henry at once gave him his check for the amount needed by Kœnig, and now the boxes had just arrived. The different objects were unpacked, discussed, many of them tried, and no wonder that I prolonged my stay in Washington for several days beyond my previous intentions.

On my last visit there in September, 1891, at the occasion of the meeting of the American Association for the Advancement of Science, I found this identical apparatus collected all together in a separate recess, while it was pointed to as a collection with which Professor Henry occupied himself some time during the latter part of his life.

I was not at all surprised that all those I met in Washington and who frequently came in contact with Professor Henry spoke unanimously in the highest terms of hi kind disposition, while all of these carry with them the same pleasant recollection and high esteem as in the case with the writer of this short notice.

La Place—Pierre Simon (1799–1827); French mathematician, physicist and eminent astronomer equal to Newton, who had left some astronomical matters unsettled and unexplained, but which La Place fully illustrated in his famous book "Mecanique Celeste," which was the crowning glory of his scientfic career. His influence upon the progress of electric science was not as direct as that of other eminent men, but his method of applying mathematics upon new methods of research has been followed by the modern mathematical electricians, who have founded a system which has largely contributed to elevate electricity from mere empirical data to the place of a positive science, which means a science in which the results to be expected from certain combinations, can previously be positively determined by theoretical calculations, provided the theory is not incomplete. The so often talked of disagreement of theory and practice is simply caused by an incomplete theory, which may be correct as far it goes, but does not agree with practice by reason of missing links. La Place's great work the "Mecanique Celeste," illustrates how perfectly the theory of gravitation will agree with practice when all side issues are considered and taken in account, and our planetary system is a practical illustration of this perfect correspondence, which Newton failed to bring forth because he did not apply the whole scope of his theory. It is the same with electricity.

National Electric Light Association.

We have received the following self-explanatory letter:

NEW YORK, January 13, 1892.

TO THE EDITOR OF ELECTRICAL REVIEW:

The following letter has been sent to associate members of this Association:

"The fifteenth convention of this Association will be held in Buffalo, N. Y., February 23, 24 and 25 next; headquarters at the Iroquois Hotel.

"Inquiries have been made regarding the holding of an exhibition in connection with the meeting, but the matter has not yet been decided. Should enough members signify their desire to exhibit to justify the management in taking such action, space and power will be provided *gratis*.

"Kindly advise me at your earliest convenience of your wishes in the matter." Very respectfully,

GEO. F. PORTER, Secretary.

Rockford Electric Manufacturing Company.

The annual meeting of the stockholders of the Rockford Electric Manufacturing Company was held January 12, 1892, at Rockford, Ill. The report of the secretary and treasurer showed the affairs of the company to be in a very satisfactory condition and the future prospects exceedingly bright. The officers and directors for the ensuing year will be C. M. Haven, president; G. E. Knight, vice-president; W. B. Roberts, secretary and treasurer and general manager; George A. Mayo, superintendent and electrician; G. F. Penfield, W. F. Woodruff, E. H. Marsh, J. W. Calkins, directors.

PERSONAL.

Messrs. H. L. Webb, George H. Guy and C. McL. Paine have resigned from the staff of *Electricity*.

Mr. Ralph Shainwald, president of the Standard Paint Company, New York, left last week for the Pacific coast on business for his company.

Prof. W. E. Ayrton, F. R. S., president of the British Physical Society, has been elected president of the British Institution of Electrical Engineers.

Vice-President C. A. Coffin, of the Thomson-Houston Company, and General Manager R. T. McDonald, of the Fort Wayne Company, were in New York last week.

The Detroit Electrical Works announce that Mr. Frank B. Rae is no longer connected with them. His patents on electric railway and other works have been assigned to them.

There has been quite a general epidemic of the grip at the works of the Thomson-Houston Company, at Lynn, recently, a number of the heads of department being seriously attacked. We are glad to state, however, that no fatal cases are reported, and that the disease is now on the wane.

Mr. M. J. Sullivan, formerly with the intelligence bureau of the Edison General Electric Company, of this city, has accepted the editorship of the *Street Railway Gazette*, of Chicago. This journal will hereafter appear as a weekly, and under Mr. Sullivan's energetic management should take a prominent place in street railway circles.

Telephonic News

*** The Long Distance Telephone lines have reached Bellefonte, Pa., and that place will soon have telephonic communication with Philadelphia.

*** At the end of the year the Telephone Company of Austria will cease to exist, the government assuming control of all the telephone lines of the kingdom.

*** Proceedings have been commenced for the voluntary dissolution of the West Coast Telephone Company and the Telephone Construction Company.

*** The council committees on ordinances and streets and street railways of Cleveland, O., have granted the Long Distance Telephone Company a franchise in the streets.

Electric Power for Flour Mills.

We have received the following letter from Kingsland Smith & Company, proprietors of large flour mills at St. Paul, Minn.:

ST. PAUL, MINN., January 6, 1892.

TO THE EDITOR OF ELECTRICAL REVIEW:

We send you by same mail a marked copy of the St. Paul *Globe*, of January 3, and would call your attention to the article marked "Revolution in Sight."

We believe that this movement to use electricity in establishments requiring more than a small amount of power is one that is of general interest to all in the electric business, and that you would render a service to electric science to reproduce this article.

Since it has appeared I have received communications from parties engaged in the manufacture of motors and generators in various cities, and I should be glad to consider any communications from those who are in position to install plants for the electrical transmission of power. The amount of power that we propose to use is not mentioned in the *Globe* article. Our intention is to use about 80 horse-power in the start.

Yours truly,
KINGSLAND SMITH & COMPANY.

The article referred to is as follows:

The manufacture of flour is on the eve of being revolutionized. This is a most important announcement to the citizens of St. Paul and Minneapolis, in which cities are located the largest milling establishments in the country. The Pillsbury mills, the Washburn mills and the St. Paul mills are known throughout the world for the high-class character of their flour. The pioneer in the work of revolutionizing the milling industry is a St. Paul man—Kingsland Smith, head of the firm of Kingsland Smith & Company, successor to the St. Paul Roller Mill Company. The St. Paul roller mill, situated on West Third street, was burned to the ground a little over two years ago. The mill has remained in ruins up till to-day, but there is every probability that it will be restored at an early date. The mere fact of the rebuilding of the mill is of small importance compared to the innovations Mr. Smith proposes to introduce.

Mr. Smith is something of a reformer. When he built the old roller mill it was something of a novelty. Old millers, like William Lindeke, declared that the millstones could not be supplanted by rolls, but events proved that the rolls were far superior to stones. It will thus be seen that Mr. Smith is no "theorist" in the milling, but a practical and successful miller. The latest thing to which Mr. Smith has turned his attention is in experiments in electricity as a motive power. These experiments have covered a period of over a year, and Mr. Smith says: "I have become thoroughly convinced of its cheapness and its entire practicability." There is not, so far as has been reported in the columns of the electrical press, a mill in existence run by electric power, and its introduction into mills will be a step in advance as far as was the introduction of rolls in 1880. Mr. Smith is now engaged organizing a new company. This company will rebuild the roller mill, and the intention is that it will be operated by electricity. Mr. Smith says: "I have not definitely decided on how and where I shall get this power, but am figuring on a plan which, if it is carried out, as I think it can be, will revolutionize the question of cheap power in St. Paul."

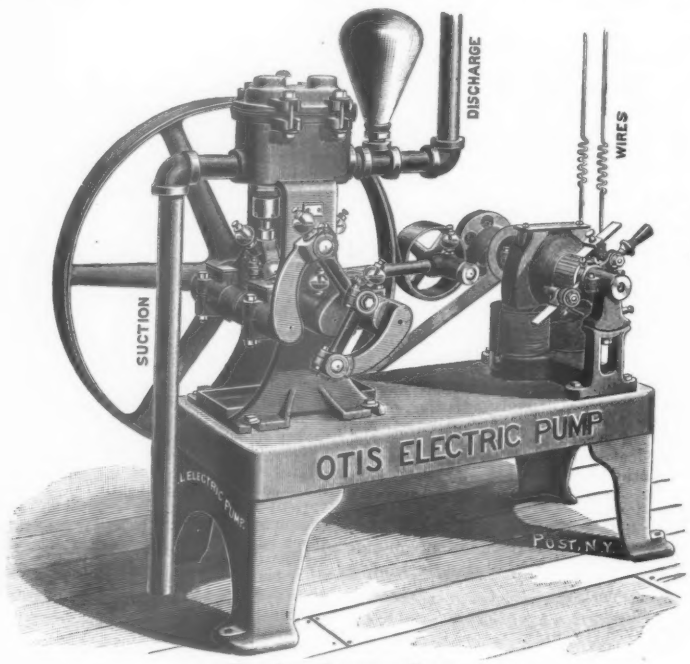
Slowly, step by step, electricity is forcing steam power into the background. The success of Mr. Smith's experiments cannot be overestimated, and their value cannot be conceived until fairly put into active operation.

The Otis Electric Pump.

Otis Brothers & Company, New York, the well-known elevator manufacturers, have just put upon the market the electric pump illustrated herewith. Motive power is furnished by a Crocker-Wheeler motor.

Prominent among the advantages of this pump is its entire freedom from the shock, jar, or water-hammer, noticeable in many pumps; another is the economy in power naturally resulting from the constant motion of the column of water, as it does not require as much power to keep a body in constant motion as it does to move it with an alternate starting and stopping motion.

Another advantage arising as a natural result of the continuous action is the even distribution of the work at all points of the revolution of the pump, thereby creating a uniform resistance to the action of the electric motor. This is absolutely necessary to insure durability.



THE OTIS ELECTRIC PUMP.

To be brief, the continuous-acting principle, upon which all of those pumps are constructed, avoids all of that harsh, noisy and unsteady operation so common in pumping machinery in general.

For domestic use, and other light services, they are eminently adapted to supersede steam, gas, oil, hot air engines, etc., wherever it is possible to connect with the lines of the electric lighting or power circuit.

The following are some of the features of importance which commend this pump:

It is automatic in its action, and always keeps the tank full, without requiring attention or the services of an attendant, the action being as follows: There is placed at the tank, and in the electric circuit, a switch or cut-out, which is operated by the action of a float, as it rises and falls with the water; for instance, when the tank has filled to the desired height, the float acts to cause the switch to break the circuit and stop the pump until the water level is lowered by drawing from the tank, and the float descends and causes the switch to again complete the circuit and start the pump, to again fill the tank; when it will again be stopped, until more water is drawn out.

These pumps are particularly adapted to furnishing water for domestic use, for office buildings, for irrigation, for watering live stock, for protection in case of fire, operating elevators, as well as for many other purposes.

Edison Sockets.

The Edison General Electric Company is known to be progressive in all that pertains to electrical improvement. The Edison key socket for incandescent lamps is the latest device which has received the attention of the company's inventors. The Edison key socket is almost too familiar to require more than a passing mention. It still retains the characteristic feature of the phosphor-bronze spring tongue which is pressed by a cam key upon the lamp tip, making a sliding and perfect contact. In the eyes of busy men, however, it has one great defect—that is, when used on flexible pendants, it requires two hands to operate it with ease. This was considered one hand too many, and a push button or pressure socket, shown in Fig. 2, was then devised by the Edison Company embodying so many novel features as to make it a real innovation. It is of the same size as the standard key socket, but the key is replaced by a spring button and small catch. That part of the button in the interior of the socket is furnished with a small plug of insulating material, around which is set a small metal ring which serves as the contact piece. Pressure on the button thrusts the plug and contact piece between four small phosphor-bronze spring brushes and the lamp is immediately lighted, the button being held in place by a small retaining catch which is also operated by a spring. To extinguish the lamp, the slightest pressure on the catch is alone necessary. The button is released, springs out, and the contact is instantaneously broken. This socket is now in general use with flexible pendants and since its inception has been greatly improved, in so far as the interior mechanism is concerned. Any defects which may have manifested themselves in the earlier type of this class of sockets have been carefully eliminated.

FIG. 1.—EDISON NEW KEYLESS SOCKET.

FIG. 2.—EDISON PUSH BUTTON SOCKET.

The use of the standard keyless socket on fixtures of that artistic character which pervades the whole fixture department of the Edison General Electric Company, has been by them decried, and it became necessary to invent a socket which could be used on artistic fixtures, and not give to them the heavy appearance entailed by the use of the standard keyless socket. The result is the improved keyless socket, Fig. 1, the dimensions of which are about one and one-fourth inches by one inch. Its interior construction is simplicity itself and it is consequently covered by strong patents. The possibility of short circuiting has been reduced to a minimum. It is the smallest socket which will take a lamp of 16 candle-power, or upwards, that there is in the market.

Still another new socket is the hard rubber keyless socket, shown in Fig. 3. This consists of a hard rubber shell covering the interior parts of the socket which are imbedded in insulating material impervious to the disintegrating influences of moisture and acid fumes. In this case the contact wires are led out from the socket through two small peculiarly constructed holes at the top of the socket. It is already used extensively in breweries, laundries and distilleries, where moisture is ever present, and it has also been successfully used in tunnel lighting.

The other types of sockets and wall sockets, or receptacles, of Edison manufacture, are too well known to need further notice. One distinct improvement, however, which the Edison Company will make in all their sockets should not be omitted. They have recently established at Schenectady a porcelain factory, where they now employ some of the best talent in the construction of porcelain electrical devices to be found in the United States. The insulation which they have used in their sockets has, heretofore, been of the best material that they could find in the market. This has not, however, given satisfaction in every instance, and their sockets, with the exception of the rubber covered socket, will, within a very short time, have their insulation entirely of porcelain.

The extensive facilities for the manufacture of small appliances which the Edison General Electric Company now have at their Schenectady works, which have been considerably enlarged, enable them to meet promptly the numerous demands constantly made upon them, and their characteristic energy is kept constantly up to the high standard they have set for themselves.

FIG. 3.—EDISON HARD RUBBER KEYLESS SOCKET.

Electricity for Mining in the West.

The electric plant of the Virginius mine, in California, is a fair illustration of the enormous benefits to Western mining interests which have been brought about by the application of electricity as a motive power of mining machinery. The Virginius is situated on Mount Sneffles, near Ouray, at an altitude of some 12,500 feet. It formerly cost $15 per ton for coal with which to operate this mine, as all fuel had to be transported up the mountains on burros.

The cost of coal reached the sum of $100 per day, or an aggregate annual expense of $36,000 for fuel alone. Every cent of this heavy running expense is now saved to the mine owners. The new operating force of the Virginius is water power transmitted by the dynamos being located in Red Canon Creek, four miles from the mine.

It is only through the cheap medium of electricity that several other mines of less ore value are worked with a profit. The great Anaconda mine, near Butte, Mont., uses electricity very largely now for refining copper and for mining the ore.

The Erie Telephone Companies, so the *Boston News Bureau* states, have underground in Minneapolis, St. Paul and Cleveland, 2,611 miles of wire and 68 miles of cable duct.

Electricity on the Illinois Central Railroad.

At a recent meeting of the directors of the Illinois Central Railroad Company, Messrs. Norman B. Ream and J. W. Doane, were appointed a committee to investigate and report upon the feasibility of applying electric power upon the company's trains, inside of the limits of Chicago, and these gentlemen are hard at work upon the task, expecting to be able to report within a month. The advantages of electricity over all other methods of propelling street cars makes it an obvious improvement over steam for the purpose of long distance traffic as well. Its cleanliness and comparative safety are sufficient reasons for its adoption in the case of suburban traffic, certainly, and especially is it advisable in the case of the Central at Chicago, where so much complaint has been made of the smut, soot and cinders evolved by the steam locomotives.

This railroad shows a commendable spirit of enterprise in taking this step and will raise itself high in popular favor by carrying the scheme through to an accomplished fact.

The use of electric power for main lines now seems a foregone conclusion, and we are undoubtedly on the eve of remarkable developments in this direction, not dreamed of even a year ago. There are hints that if the Chicago experiment is made a success, it will lead to the adoption of a similar scheme by the New York Central, for its New York city tunnels, and it is stated that the New York Central experts are directed to place themselves and the results of their experiments at the disposal of the Illinois Central.

The Galveston, Tex., City Railway.

This company was chartered in 1866 and began operation in 1868 on a small scale. Later, in 1874, the People's Railroad Company began operating its lines, but after an existence of five or six years sold out to the Galveston City Railroad Company. Last January the company was operating 45 mule cars over 23 miles of track. In May the year previous the stockholders had voted to equip the lines electrically and on February 6 last the first electric car left the motor house at the corner of Center street and Avenue I. The company has entirely rebuilt to date 26 miles of track, using 40-pound steel rails and 3,000 ties to the mile, and all necessary overhead wires, making a first-class track. The balance of the lines will be completed by May, 1892, when the total mileage operated electrically will be 40 miles, all within the city limits.

It now has 22 motor cars, 12 trailers and 43 mule cars. Twenty additional motor cars are to be delivered on or before May 1, 1892.

The power house was erected at a cost of $30,000, exclusive of the machinery used in it. In it are four 150 horse-power boilers, one 400 horse-power compound condensing Corliss engine, two compound condensing Westinghouse engines of 150 horse-power each, one Edison 250 horse-power generator and two Rae generators of 100 horse-power each.

The company has expended to date over $300,000 for buildings, electrical equipment and reconstruction of lines, and will spend an additional $100,000 to complete its system, for the purchase of more cars, motor equipments, etc.

The company has expended during the past year over $100,000 for labor. The gross earnings for the past year have been $156,000, which represents 3,120,000 passengers carried, and an increase of $22,968.14 over the earnings of 1890, which showing, considering the fact that at some one time during the whole of 1891, first East and West Broadway, then Market street, and now the Garten Verein and Thirty-third street lines, were not operated because of being reconstructed for the purpose of operating electrically, is highly satisfactory and fully justifies the management in the heavy expenditures they have made for the purpose of securing rapid transit.

The net earnings for the year will aggregate $60,000.

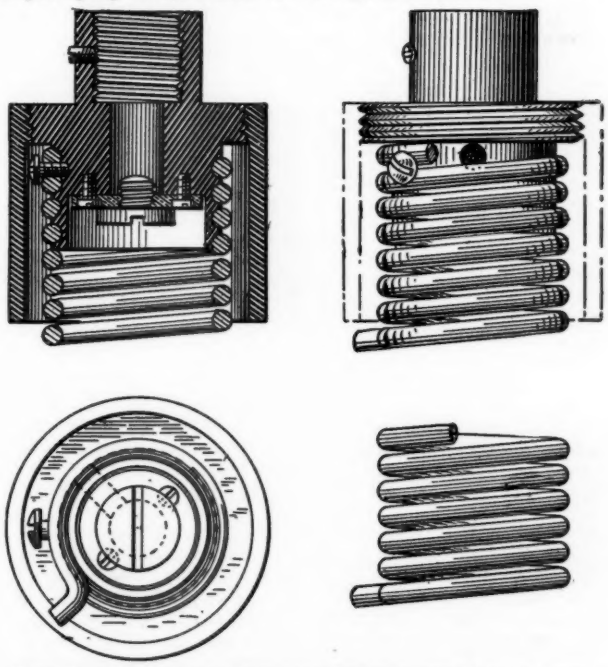
The board of directors is composed of Colonel William H. Sinclair, the controlling genius and real motive power of the concern; Julius Runge, A. J. Walker, D. Freeman, Leon Blum and Mayor R. L. Fulton. Mr. H. Kellner is secretary and treasurer and Mr. M. J. Keenan is superintendent.

United States Government Standard Lamp Holder and Socket.

We illustrate herewith the new standard incandescent lamp holder and socket adopted by the United States government for use on all its war vessels. This apparatus has been devised and adopted by the Naval Lighting Bureau after much careful study of the necessities of the service by the superintendent, Commander Newell, and his assistants, and it is believed that it will meet all the requirements. The ordinary stiff lamp holders were very unsatisfactory, even for use on shore, and on shipboard, where they are

THE STANLEY ELECTRIC MANUFACTURING COMPANY'S NEW PRIMARY FUSE BOX.

subjected to very severe jars from the pitching of the vessels, and especially from the firing of heavy guns, the breakage of the lamps and other parts of the apparatus has been very serious. The illustrations clearly show the device and hardly need explanation. The socket into which the lamp is screwed is formed of a steel wire spirally coiled so as to tightly fit the screw shank of the lamp. When the lamp is screwed into position it is impossible for it to become accidentally loosened, and the spiral wire socket has just spring enough to allow for



FULL SIZE DRAWINGS OF STANDARD INCANDESCENT LAMP HOLDER FOR UNITED STATES NAVY.

any jar or vibration without injury to the apparatus. Up to this time the vessels of the navy on which electric lights have been installed have been provided with a great variety of lamps and holders, and, in order to continue their use, it has been necessary for the department to have a quantity of obsolete articles on hand, while vessels on distant stations have often been unable to exchange supplies. Hereafter all the new vessels will be provided with the new standard holders, and the plants on the old vessels will be changed as rapidly as possible. This is one of the many improvements which are being made by the lighting bureau, and will be of great advantage to the service.

The Stanley Electric Manufacturing Company's New Primary Fuse Box.

The unique and very safe and convenient form of fuse on the Stanley transformer has created a demand for the same style of box separate from the transformer, and the company is now manufacturing them as shown in the cut on this page.

Wherever a branch is taken off from the main primary wires it is very desirable to fuse it, so that if a short circuit occurs on that branch the lights supplied by it will alone be affected. If the fuse is not so used, a short circuit anywhere on the primary wires may blow the main fuses in the station, and so occasion a much more serious interruption to the service.

The fuse box illustrated is suitable for use on primary circuits carrying current up to 15 amperes (300 lights on 1,000 volts, or 600 lights on 2,000 volts) and is, it is claimed, the safest and most convenient box made. Its interior construction is the same as the fuse box on the Stanley transformer, which is now too well known to need description here. The points of superiority claimed for this fuse box are:

1. It is, of course, double pole, and each fuse is in a separate porcelain chamber, so that when a fuse blows there is no danger of the current short circuiting from one pole to the other. This is the worst objection to most primary fuse boxes.

2. A fuse can be replaced on a live line with perfect safety and in a very short time, and the use of screw driver or wrench is entirely unnecessary.

3. The porcelain plugs in all boxes are interchangeable, so that by having an extra plug or two, no work is necessary while on the pole.

TELEGRAPHIC

.... A syndicate has been formed to establish a telegraph line between Kingston and Lenoir City, Tenn.

.... The Western Union Telegraph Company is providing Appleton, Wis., with synchronized clocks.

.... The telegraphic revenue in England for 1890 was nearly $12,000,000, an increase of $300,000 over 1889.

.... There is now in China a quite comprehensive system of telegraph lines running to all parts of the country.

.... Work on the 225 mile cable which is to connect Florida and the Bahamas is to be commenced some time this month.

.... The Western Union Telegraph Company's office at Nashville, Tenn., was destroyed by fire recently. New quarters were quickly found and work progressed as usual.

.... The Dakota, Wyoming and Missouri River Railroad has entered into a contract with the Western Union Telegraph Company for the construction of a telegraph line at an early date along its roadbed between Rapid City and Mystic, S. D.

.... The Westinghouse pneumatic switch system is being tried by the Pennsylvania Railroad Company on its new yard east of Altoona, Pa. This system does away with all the switch levers in the towers, as the switches are operated by electrical currents. Compressed air is the motive power and electricity controls the air.

.... The Railroad Commission of Georgia issued an order on the 8th inst. prohibiting telegraph companies from charging more than 25 cents for any message of ten words or less, exclusive of name and address, and two cents for each additional word between any point within the limits of the State. The order goes into effect February 1.

.... According to the *Boston News Bureau*, recent investigations of the committee representing the bondholders of the American Rapid Telegraph Company have shown that the Western Union Telegraph Company has failed to maintain the plant in the condition in which it was placed with it at a rental of $5,000 per month, and a demand has been made to have it placed in thorough repair. Several parties, it is stated, have been desirous of purchasing the American Rapid Telegraph lines.

North American Phonograph Company.

The North American Phonograph Company recently elected a new board of trustees consisting of Thomas A. Edison, Samuel Insull, J. N. Bush, Thomas R. Lombard, Scott Tremaine, W. Nolan and A. O. Tate. The officers are: Samuel Insull, president; T. R. Lombard, vice-president; T. Butler, treasurer and M. Wolcott, secretary At a meeting held January 5 an executive committee, consisting of Messrs. Edison, Insull and Bush, was appointed. It is understood that the regular business of the company will be resumed as soon as possible.

Stokes Sues Mackay for $75,000.

In an action before Justice Ingraham in the Supreme Court of New York, recently, Edwin S. Stokes seeks to recover $75,000 from John W. Mackay and Hector de Castro for alleged breach of contract relating to stock transactions. Stokes states that in 1888 he agreed to deliver certain electric telegraph stocks for $100,000, and he claims he performed his part of the contract and the defendants paid him $25,000. Mackay denies making the contract, but de Castro admits making it, but denies that he acted as agent for Mackay in the transaction, and states that Stokes so understood it at the time.

* * Ironton, O., wants an electric street railway.

* * An electric road between Bethlehem and Fredensville is a possibility.

* * St. Louis is talking of an underground road to be operated by electricity.

* * The subject of an electric railway between Manchester and South Manchester, Conn., is being discussed.

* * Efforts are being made to connect the cities of Lowell, Lawrence and Haverhill by electric surface railway lines.

* * Washington C. H., Ohio, has caught the electric street railway fever and will make an effort to secure rapid transit.

* * The new electric street railway company, of Stockton, Cal., is investigating the subject of the most desirable system to use.

* * The Citizens' Electric Passenger Railway Company, of Harrisburg, Pa., is being organized to operate a quite extensive line of road.

* * It is stated that there is to be an electric railway from Wilmington, N. C., down the New Hanover coast to Bald Head Island.

* * It is expected that an electric railway 23 miles long, connecting Indianola with Des Moines, Ia., will be built in the near future.

* * A company has been formed to build an electric railway from Cottage City through Tisbury and Chilmark to Gay Head, Mass.

* * The water power at Garvin's Falls and Sewall's Falls, near Concord, N. H., will soon be utilized for generating electricity for light and power.

* * The West End Street Railway Company, of Boston, has appointed a commission to determine upon the best form of fender for its street cars.

* * The Reading and Southwestern Railway Company awarded to the Edison General Electric Company a contract to furnish four 20 horse-power motors.

* * A syndicate of Western capitalists has purchased 1,000 acres of land between Alexandria, Va., and Mount Vernon, and propose to run an electric road between these two places.

* * The United Electric Railroad Company, of Nashville, Tenn., executed a mortgage on its property recently to the Nashville Trust Company to secure $200,000 bonds issued.

* * The Overland Railway, of Nashville, Tenn., will probably soon be sold at auction. It is reported that the property will be purchased by Fred. W. Hunter and equipped with electric motive power.

* * Trial trips with electric locomotives are soon to be made on the French northern line between Paris and St. Denis. If the result is satisfactory, trips will be made over the line between Paris and Calais.

* * The Thomson-Houston Electric Company has installed 63 new electric roads in the United States this year, and it is stated that it has orders for five hundred 25 horse-power W. P. street railway motors unfilled.

* * It is predicted that electric roads will be built about Southern Chatauqua for the purpose mainly of moving the grape crop to the steam railroad stations. The moving of this crop is now a costly matter, owing to the bad roads.

* * An improved air brake is being tried on the Birmingham, N. Y., Electric Street Railroad. If it proves a success it will be put on all the traction lines of the McKee syndicate. It has been run for a month giving good satisfaction, so it is stated.

Thomson-Houston Marine Apparatus.

"In the case of the 'Newark,' the Thomson-Houston Electric Company, having the contract for the installation, the generating sets have not met the specifications in that the dynamos are not properly compounded, and the heating limit allowed has been largely exceeded and no search-lights have been furnished; it is hoped, however, that these defects and deficiencies will, before long, be made good."

The above is an extract from the annual report of the Naval Inspector of Electric Lighting at the United States Bureau of Equipment, under date of October 30, 1891, and published in the ELECTRICAL REVIEW, December 12, 1891.

Since the date of the report referred to, the Thomson-Houston Electric Company, of Boston, have designed, built and placed in position on the "Newark" three generating sets, which have met the requirements of the specifications of the United States Bureau of Equipment in every particular.

The dynamos are of the multipolar type, each having a capacity of 200 amperes at 80 volts, with 400 revolutions of the armatures. The armatures are coupled directly to the engine shafts, no belts being used.

The engines are special double Armington & Sims engines, cylinders 7x5, making 400 revolutions. The engines and dynamos in each set are on one bedplate.

These generating sets were tested by United States inspectors, approved and accepted by them, meeting their requirements that the dynamos shall not vary from no load to full load more than two volts and the armature shall not heat more than 50 degrees above temperature of surrounding atmosphere.

Four search-lights of 50,000 to 75,000 candle-power have also been installed on the same ship.

* * President J. H. Johnston, of the City and Suburban Railway Company, of Savannah, Ga., at the annual meeting on December 31, recommended an electric equipment for the street car lines. A committee was appointed to carry out his suggestions.

* * President Whitney, of the West End Street Railroad, Boston, recently addressed a letter to the mayor and board of aldermen proposing a commission of three to recommend a satisfactory fender for electric cars. The board refused to adopt the suggestion.

* * The president of the street railway company of Indianapolis issued an order recently, to take effect on February 1, curtailing the dead-head privileges of the railroad to employés. The brotherhood of drivers and conductors and motor men resent the action and decided to make it a cause of war unless rescinded.

* * The net earnings of the West End Street Railway Company, of Boston, for the quarter ending December 31, 1891, compared with the same period of 1890, are as follows:

	1891.	1890.	Inc.	Dec.
Gross earn'gs.	$1,549,496	$1,493,584	$55,913	.....
Ex. & charges	1,270,249	1,330,526	.....	$60,276
Sur. for divs.	279,247	163,058	116,189	.....

* * Arrangements have practically been completed for the construction of the proposed electric street railway along the beach front of Cape May, N. J., extending a distance of seven miles. The road will cost between $150,000 and $200,000, and will be controlled by Philadelphia and New York capitalists. It is expected that work will begin about February 15, and that the road will be completed in time for the pleasure travel of the coming Summer.

* * The commissioners appointed to appraise the damage likely to accrue to certain land owners by the building of the Inter-State Water and Electric Power Company's dam, across the Kaw River, Kansas, made their report on the 23d ult., naming simply nominal damages. The project of this company is to build a dam across the Kaw River, near Muncie, and convert the power obtained into electricity for motive power and light. The company proposes to spend $500,000 in erecting its plant, and will supply current at distances up to 25 miles.

LITERARY.

The REVIEW takes occasion to acknowledge the receipt of the following books and pamphlets:

"Brick" Pomeroy's Golden Thought Dairy Journal, 1892.

Reports of the Consuls of the United States, No. 132, September, 1891.

Bulletin 34, Horticultural Division, Cornell University, Agricultural Experiment Station.

We have received Bulletin No. 33, from the Cornell University agricultural experiment station.

"Transactions of the Denver Society of Civil Engineers," July to December, 1890, has been received.

We have received from the Inter-State Commerce Commission an advance copy of "Statistics of Railways in the United States."

President Harrison's daughter, Mrs. McKee, has written her first article. It treats of "The Training of Children," and will be printed in the February issue of *The Ladies' Home Journal*.

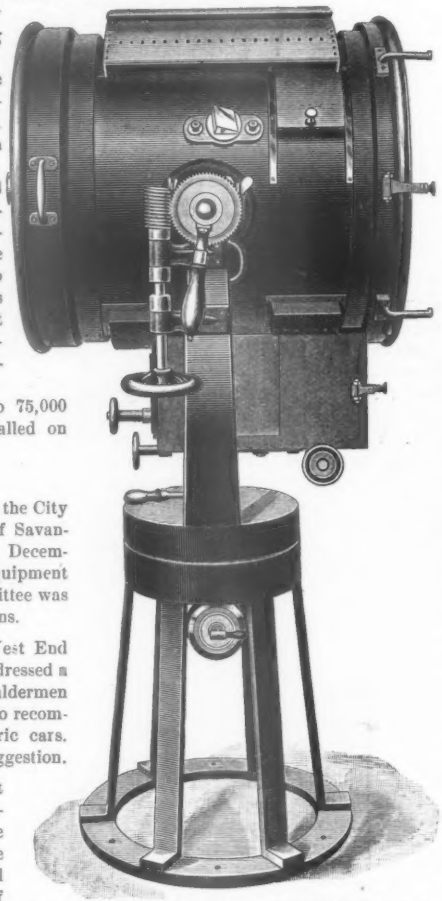


FIG. 1.—THOMSON-HOUSTON SEARCH-LIGHT FOR UNITED STATES CRUISER "NEWARK."

We have received the French journal of the Bureau of Longitudes, *L'Annuaire du Bureau des Longitudes*, for 1892. This annual contains interesting articles by prominent men on the subjects of moneys, statistics, geography, mineralogy, etc., and is well worth perusal.

The publishers of *Scribner's Magazine* have sent us a cloth-bound index to the first 10 volumes of this most interesting periodical. It marks the completion of the fifth year of the publication of the magazine and will be a welcome addition to the libraries of lovers of American magazine literature.

An epitome of the present situation of American agriculture forms a prominent and the most practical and valuable feature of the *American Agriculturist* (New York) for January, in which issue this old reliable magazine celebrates its fiftieth anniversary. In this epitome our relation to the world's food supply is given, and an estimate of American production and requirements.

Over 700,000 women in this country alone now buy and read each month *The Ladies' Home Journal*, and a study of the January number, just to hand, shows at once why the *Journal* is so popular. It is in complete touch with a woman's best needs, and covers everything in her life. No magazine covers its special field so thoroughly, and in such a fresh and capable manner.

A portrait of Gounod, the celebrated French composer, forms the frontispiece of the January *Century*, and along with the portrait is a charming paper of reminiscence of the early life of the musician. His experience as a student of music in Rome and his later acquaintance with Mendelssohn are delightfully narrated. This paper by Gounod is one of a musical series which will make *The Century* especially attractive to lovers of music during the coming year.

The January *St. Nicholas* begins with a charming frontispiece described by a no less excellent poem written by Helen Gray Cone: "The Little Maid of Spain"—a little lady, every inch of her. The number, by the way, is rich in verse, as there are poems by Celia Thaxter, Edith M. Thomas, Anna M. Pratt, Mrs. Bumstead, Jack Bennett and others. The "Admiral's Caravan" is continued, and should be quite as popular as the same author's "Davy and the Goblin," being equally clever and even more humorous.

The last poem written by James Russell Lowell, the only one of importance left by him in manuscript, and at the same time one of the strongest in the whole list of his works, will be published by arrangement with Professor Charles Eliot Norton, his literary executor, in the March number of *Scribner's Magazine*. The admirers of Mr. Lowell will be gratified to find it a great and noble poem, fitted to form the close of his poetical career. It is in the vein of Mr. Lowell's highest and broadest patriotism and will rank with the Commemoration Ode. The poem is entitled "On a Bust of General Grant."

A literary event of unusual importance is to be the publication, in the March number of *Scribner's Magazine*, of a very remarkable and noble poem—the last one written by James Russell Lowell, and the only one of consequence which he left in manuscript. This fact alone, of course, would give it an extraordinary interest; but the literary importance and the character of the poem itself are more impressive than the circumstances of its publication. Its title, "On a Bust of General Grant," marks it as belonging to a group of Mr. Lowell's poems of patriotism and high public duty, among which it will rank with the great passages of the Commemoration Ode. With the text of the poem, which is published by arrangement with Mr. Lowell's literary executor, Prof. Charles Eliot Norton, will be printed a *facsimile* from the manuscript of one of the finest stanzas.

The following tribute to the work of an American magazine is contained in the report of the Secretary of the Interior just submitted to Congress:

"Your attention is also requested to the paper contributed by Mr. John Muir to the number of *The Century* illustrated monthly magazine for November, 1891, entitled 'A Rival of the Yosemite—the Cañon of the South Fork of Kings river, California.' It furnishes maps of this section and is illustrated by most admirable engravings of the wonderful scenery there existing. The engravings are chiefly from the pencil of Mr. Charles D. Robinson. These gentlemen, as well as the editors of *The Century*, especially Mr. Johnson, have taken a great personal interest in the forest reserves in California, and are worthy of great consideration, both from their experience and intelligence. The magazine article mentioned advocates the extension of the Sequoia National Park so as to embrace the Kings river region and the Kaweah and Tule Sequoia groves. The boundaries are there set forth. The subject is recommended to your favorable consideration and action."

* * At an enthusiastic meeting held at College Park, Md., recently, a committee, composed of Dr. Wiley, J. A. Johnson, J. A. Blundon, Dr. Bliss, W. A. Bartlett and J. H. Ralston, was appointed to consider the subject of an electric railway between Washington, D. C., and Branchville, Md. This committee meets at Room 3 A, *Sun* Building, Washington.

Buffalo Electrical Society.

The Buffalo Electrical Society proposes to take up the study of physics as a class, devoting each alternate meeting to this purpose.

Cleveland Electric Club.

The formal opening of the new quarters of the Cleveland Electric Club took place on the 6th inst., and was a very enjoyable occasion. This Club now has a membership of 40, and numerous applications are under consideration, which is an excellent showing for the short time it has been in existence.

A New Scientific and Social Organization.

A petition was filed by the following named persons: A. C. Wolfram, R. N. Scudder, John Holdsworth and E. Ruebel, on the 28th ult., in St. Louis, for authority to form a scientific and social organization, to be known as the St. Louis Electric Exchange.

The object of the organization is to encourage inventions and improvements in electrical appliances, foster an interchange of thought and unite socially members of the Exchange more intimately.

Dr. Herman Hollerith at the New York Electric Club.

The lecture to be delivered before the New York Electric Club by Dr. Herman Hollerith, of Washington, as mentioned in the ELECTRICAL REVIEW last week, has been arranged for the evening of January 28.

Dr. Hollerith's electrical apparatus, which was used in tabulating the returns of the last census, will be shown in actual operation by the inventor. Interesting information will be given as to census statistics and data. The exhibition will also include some of the old methods of compiling the census.

Dr. Hollerith's inventions, which have recently been adopted for census purposes by the governments of Canada and Austria, has never before been exhibited in public. The interest taken in census matters by the public, especially in New York city, makes this exhibition and address one of great timeliness.

Dr. Hollerith is a member of the Club and his fellow members will doubtless provide a large audience to hear what promises to be an address of absorbing interest.

—— The commissioners of highways of the town of Jamaica, L. I., at their meeting on the 22d ult., revoked an electric light franchise granted last May to the Buckhouse Electric Lighting Company.

Pittsburgh Electric Club.

Electrically speaking, the year 1892 has opened very auspiciously in the city of Pittsburgh, Pa., inasmuch as the local Electric Club threw open the door of its own home and invited its friends to a grand reception.

At the first regular meeting of the Club, after it had been organized with 71 charter members, the officers were elected as follows: Morris W. Mead, chief of the Electrical Bureau of Pittsburgh, was made president; Eugene Ingold, of the Ft. Wayne Electric Company, vice-president; James A. Rutherford, of the railway department Westinghouse Electric and Manufacturing Company, treasurer; J. E. Hall, of the Ft. Wayne Electric Company, secretary; H. McL. Harding and Ph. Lange, of the Westinghouse Company; E. B. Gawthrop and D. W. Dunn, of the Thomson-Houston Company; Isaac A. Silverman and E. B. Kettle, of the Edison Company, and W. H. Dillon, of the Brush Company, were elected a board of directors.

Immediately afterward, the president appointed a committee to secure permanent quarters for the location of the Club. This committee had a very arduous task, for the reason that it is a very difficult thing to find a house at once central located and without an exorbitant rental. However, these men have succeeded beyond the most sanguine expectations of anybody, and too much credit cannot be given them for their zeal, ardor and unwavering perseverance.

The club house is situated at 802 Penn avenue, a location in the very heart of the down-town portion of the city. It is equidistant from all the railroad depots, can be easily reached from any hotel, and cars pass in front of the Club building by which one may take a continuous ride of eight miles in one straight line. The building itself is three stories high and is furnished throughout in antique oak. On the ground floor are two reception rooms connected by a double folding door. In the rear of these rooms are the buffet, the dining room and the steward's quarters. On the second floor are the billiard-room, card-room and reading-room, while on the third floor are three bedrooms. The place is throughout fitted up with all the modern conveniences of a first-class club house.

The reception on the first of January was a very great treat. It was attended by about 500 people, who were all exuberant with praise and flattery for the Club and the committee of arrangements, a fact which alone stamped the undertaking an unqualified success at the very start. The Club had arranged a very seductive bill of fare for their guests, and it is safe to assert that nobody came and went without being able to do full homage to the hospitality of the Pittsburgh Electric Club.

The most attractive feature on the menu was "an electric punch," and its electrical effects were generally compared with those of the nectar of the Olympian gods.

New York City Lighting.

Contracts for lighting by electricity have been awarded to several electric lighting companies at an average of about 40 cents a night per lamp, the same price as last year. The bids of companies that wanted more were laid over.

Important Supreme Court Decision in New Jersey.

The New Jersey supreme court, on the 8th inst., set aside the Trenton City ordinance by which the Trenton Passenger Railway Company received permission to erect poles and wires for electric street cars.

In the opinion of Justice Reed, the statute under which the ordinance purported to act does not stipulate anything about poles or wires in the streets, and that no authority is granted to erect them.

Electrical Letter Stamping Machines.

Three machines for stamping letters have recently been put in operation at the Pittsburgh post office.

It is stated that each of these machines can do the work of ten men or stamp 40,000 instead of 3,500 letters an hour.

Letters of all sizes are placed in a chute and a spring feeds them into the stamper, which cancels the stamp and then stacks them ready for sorting. The time on the face of the post-mark will change every minute by an electrical connection with a clock.

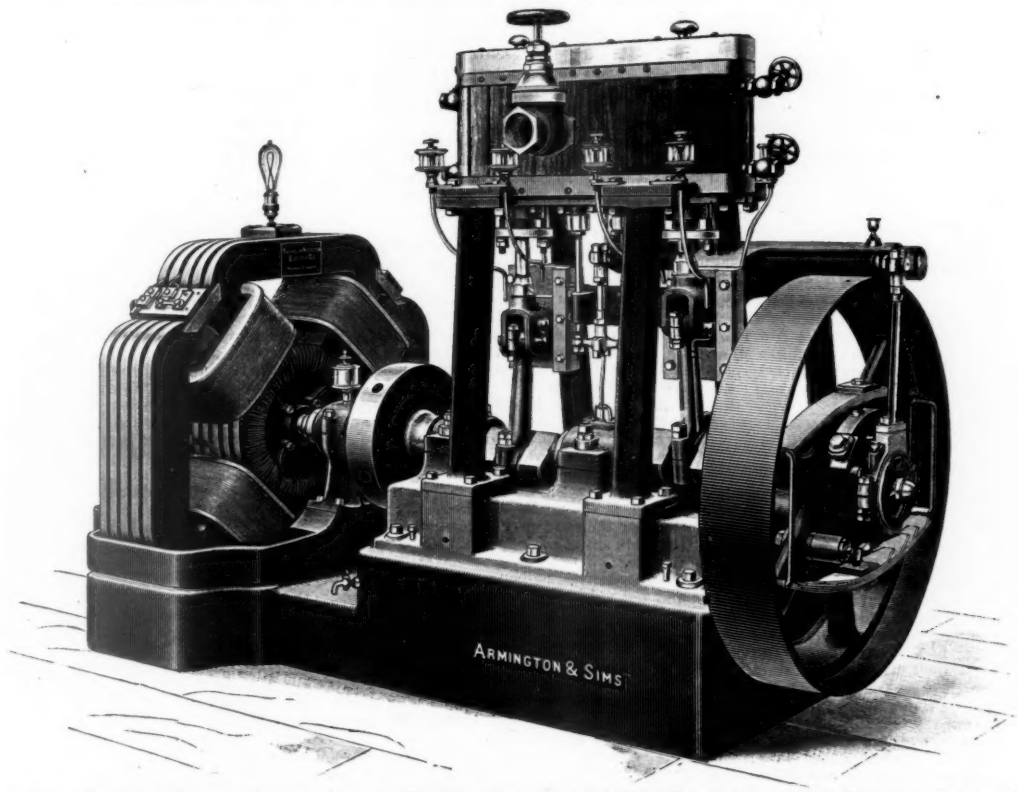


FIG. 2.—THOMSON-HOUSTON DIRECT COUPLED DYNAMO (ARMINGTON & SIMS ENGINE) FOR U. S. CRUISER "NEWARK."

The Wagner-Queen Voltmeter.

A few weeks ago we described the new portable voltmeter which bears this name, and which has been placed on the market by Queen & Company, of Philadelphia. The prominent features of this instrument are such as to render it of great value to electricians for measuring both alternating and direct currents. It is very portable, weighing only 22 ounces, and the dimensions of the case are 7¾x4x2 inches, so that it can be carried in a good sized pocket. The pointer is dead beat and direct reading, and the indications are accurate within one per cent. The price is also very low, which is of importance to those purchasers who may not feel warranted in buying a more elaborate and standard one, such as the Cardew type. We are informed by the makers that up to date the demand has far exceeded the supply of these voltmeters. A large quantity is being pushed through their factory and they hope soon to keep up with the orders as received, so that delays in shipment will not occur. It will be well for those in need of a good portable voltmeter for both alternating and direct currents to obtain a copy of Circular No 265 from Queen & Company.

ELECTRIC LIGHT NEWS

—— Dwight, Ill., is to have electric lights.

—— Beloit, Ia., is to be lighted by electricity.

—— Bowling Green, Ohio, wants electric street lights.

—— Greenville, Ga., wants electric lights for its streets.

—— LeRoy, Ill., is considering electric street lighting.

—— Alberton, Md., will have electric street lighting.

—— Corunna, Mich., will soon have electric lights for the streets.

—— Meshoppen, Pa., will probably have electric street lighting soon.

—— A. J. Ferris and E. W. Jewett are talking of lighting Swanton with electricity.

—— The Chicago and Alton Railroad proposes to light its yards in Bloomington, Ill., by electricity.

—— W. H. Girvin, of Syracuse, N. Y., has been appointed general manager of the Syracuse Electric Light and Power Company.

—— The Thomson-Houston Electric Light Company, of Ann Arbor, Mich., will add to its plant a 650 light alternating current dynamo.

—— The board of managers of the Union Station at Louisville, Ky., are seriously considering putting in an electric plant to light the same.

—— Messrs. Doying Bros., electricians, of Summit, N. J., were burned out on December 30. They sustained a loss of $7,000, covered by insurance.

—— A scheme is on foot to erect a large central station plant in Philadelphia, to furnish electric light to the suburban stations of the Pennsylvania Railroad Company.

—— On the 30th ult., the city of Estherville, Minn., passed a resolution to grant a franchise for 20 years for street lighting. Several companies have submitted propositions.

—— The Chicago office of the Thomson-Houston Electric Company has sold a 20 horse-power plant to Purdue University, La Fayette, Ind., to be used for experimental purposes.

—— Whitman, Mass., has appointed a committee, consisting of C. H. Jones, A. S. Stetson, W. R. Vining, Edward Keating and A. E. Keating, to investigate the subject of street lighting for the town.

—— The Edison General Electric Company has just closed a contract through its Boston office for 1,021 lights and fixtures for the Chamber of Commerce building in that city. The current will be taken from the local Edison central station.

—— According to Ex-Sewer Commissioner R. E. McMath, of St. Louis, in a recent interview with a *Post-Dispatch* reporter, the Municipal Electric Lighting and Power Company, should they throw up their contract and forfeit their bond of $50,000, will lay themselves liable to have their plant seized and operated by the city for the balance of the term of their agreement.

—— The officials of the city of Milwaukee, by a writ of *certiorari*, obtained from Court Commissioner Ryan and made returnable before Judge Johnson in March next, were restrained from signing the electric light contract with the Badger Illuminating Company. The writ was issued on the application of W. H. Earles, of the Power and Lighting Company. It sets forth that the action of the council was illegal and that the city has no right to award a contract without calling competitive bids.

PRACTICAL NOTES ON THE REFLECTING GALVANOMETER AND ITS ACCESSORIES.

BY J. D. BISHOP.

XII.

RESISTANCE COILS.

The usual testing set generally contains a set of 10, 20, 30 and 40,000 ohm coils. Each coil terminates in two blocks with a binding post on each. By means of a plug each one may be connected with the next, thus any one, or all, may be used as desired.

Before accepting a box of coils, remove the case and see that all the coils are firmly fixed on their pins. Take a sharp pen-knife and remove from the pin or other part of the brass work a thin shaving of paraffine with which you will find it coated. If either the shaving or the pin shows trace of greenish discoloration, refuse them. This discoloration arises from acid in the impure paraffine used, which attacks the copper in the brass, and will certainly, sooner or later, extend to the coils sufficiently to alter their value.

If no oxidation is visible, connect them up and compare their resistances singly and together by the deflection they give. If proportionate, you may accept them as good.

A most useful and, in fact, an indispensable adjunct, if you are not within reach of an electric instrument maker, is a second resistance coil of 100,000 ohms, which may be all on one bobbin. If you have an old incorrect condenser tear out its inner material and utilize its case and terminals to fix your 100,000 ohm coil in, for which it will be splendidly adapted.

The coil is very easy to make and will be found useful, not only for comparing with the divided set but also for getting a high constant by using both together instead of one. To make it, proceed as follows:

Ask your electric supply firm to furnish you with two reels of German silver wire, each about 55 or 60,000 ohms resistance. It is nearly useless for me to state the best size, as the chances are you may not be able to obtain it, but from No. 30 to 36 will be best.

As a matter of principle a larger wire is better than a small one for all resistance coils, but expense and bulk are important considerations, and as in this case the wire is never supposed to carry heavy currents a small wire is preferable.

Now provide a reel large enough to carry all the wire contained on both the others. It should have a $\frac{5}{16}$ hole bored through its axis and a $\frac{1}{8}$ hole bored close to the barrel, right through one of its disks. The reel should be of well seasoned wood, pine or beech. Bake the reel for a few hours in an oven at about 200° F. so as to thoroughly dry it. Have ready a tin panikin of melted refined paraffine wax as near boiling as possible. Remove the reel from the oven and submerge it at once in the paraffine and keep it there for 10 or 15 minutes, then take it out and hang it up to dry.

Remove the heads from a couple of large wire nails, about four inches long and drive them into a bench or piece of wood, about six inches apart, so that they will make a couple of pegs over which the two reels of wire may be placed so as to revolve freely on end.

Take a piece of No. 4 iron wire, about one foot long, and bend one end into a crank handle and pass it through the hole in the paraffined reel and mount it firmly in any simple manner, so that it may be revolved horizontally like a barrel organ.

Now, take the outer ends of each wire, strip off the silk, join the bare wires neatly and cut off a double length of ten feet. This will give you 20 feet of wire. Measure and note its resistance, and lay it aside. Now, take the ends of the wire on the reels, bare and twist them as before, and pass them through the small hole in the disk to a length of two or three feet, which coil up neatly round the iron rod and tie it fast.

Now begin to reel off the wires together, laying them smoothly on the barrel of the reel. It will be found that it is not an easy matter to prevent their over-laying each other, after one or two layers have been reeled off. To prevent this overlaying from becoming serious, when the wire has reached one end of the reel tie it there with a piece of silk. Now take a piece of stout cartridge paper, cut to fit the width of the reel tightly, and long enough to make a couple of turns round. On this new surface begin to coil again until overlaying requires another stratum of paper.

Continue this until nearly all your wire is reeled off. Now measure the resistance you have reeled off. To do this, first tie the wires down tightly to prevent their running back and with a pen-knife carefully remove the silk for a quarter of an inch on each wire between the reels and connect your bridge or galvanometer wires thereto. If it is short you can judge how much more to reel on by the resistance of the 10 foot double wire you cut off and measured before reeling, and if your resistance is too high it will be a guide to you how much to reel back.

If you have to reel up wire which has thus been bared for testing, take a small piece of oiled silk, three-quarters of an inch by one-quarter, and double it in two, longways, lay the bare part in the double of the silk and fasten it down neatly with the following turns of wire.

Get, say, 200 ohms more than your 100,000, so as to be sure you have enough, fasten your wire down and cut it off, covering the wire with six or eight turns of cartridge paper and leaving out about three feet of ends for your terminals.

Put these on the bridge and open the two inside ends previously coiled up and continue to reduce their length until a balance with the 100,000 ohms is secured. Using the inner ends for adjustment will show you at once if there is a broken wire or a contact anywhere in the reel.

If there is, shortening the inside ends will, of course, produce no variation in the resistance. If, on the contrary, the wires are both in perfect condition throughout, any alteration in their length will disturb their balance. Coil the ends into neat spirals and fix the reel on the terminals passing through the cover of a box made to receive the coils. As before stated, an old condenser case does well for this.

German silver wire supplied for resistance is hard and springy, so provision must be made for preventing the reels from revolving too quickly, or you will have trouble. For this reason the wire must always be tied before you take your fingers from it, whilst you are reeling. For the same reason it is necessary to solder all joints, not so much on account of resistance as because the spring of the wire is likely to prevent a twisted joint from being mechanically a good connection.

After fixing it finally in the box, remove the bottom, fill up with boiling paraffine, and replace the bottom when cold. A coil thus carefully made will remain perfect for ages. If you pride yourself on exactness, you may make your coil to balance exactly your 100,000 resistance set, but practically there is nothing gained by it. Within a few ohms one way or another is near enough. Many details have, of course, been omitted in the above instructions which the common sense of the reader will supply.

XIII.

CONDENSERS.

Capacity tests require greater precision of work and are liable to disturbing influences whose effects are of greater consequence than they would be on insulation tests.

It is necessary, therefore, to be very careful in your choice of a condenser. Although you may be perfectly safe in your choice of a second-hand galvanometer, it is not advisable to purchase a second-hand condenser. A condenser is an instrument of absolute measure. It must, therefore, be exact.

You may allow a certain latitude for variations in your galvanometer, but your condenser must be definite and precise. Making exact condensers seems to be an art *per se*. In the largest electrical shops in Europe they are nearly always the especial work of one man who has his own peculiar methods, which are, or are considered to be, more or less a trade secret.

The essentials of a condenser are: First. An exceedingly high insulation. Secondly. A spark resisting power of at least 1,000 volts pressure. Thirdly. Capability of retaining a very high percentage of its charge and the amount of that charge to be exactly what it is marked as being.

There is strictly no such thing as a second rate condenser. For testing, a condenser is a good one, "therefore a standard," or it is only something in the shape of a condenser. If not "standard" its indications are of no value nor will you be able to get the same results from it two days running. There are no means of altering or patching up a faulty condenser, and there is no way of discovering an error therein, or the extent of that error, save by comparison with a standard.

There are lots of poor condensers at work, and old hands, before discussing the value of any capacity will always require to know if the condenser used was correct, who made it, etc., etc.

Most of these inferior articles are homemade. A good Muirhead, Elliott, or Siemens condenser, no matter how old, is pretty sure to be correct, or if not correct, the error remains constant. It may be safe, therefore, to buy one after comparison with a well known standard. But it is not advisable even to run this risk, for though many condensers made in the States are nearly worthless, still, it is possible to get them quite equal too and, I believe myself, superior to any made in Europe.

Mr. Marshall, of University Place, New York, seems to be the only one who has successfully mastered the mysteries of the art. His patent multiple condensers are as near perfection as possible, and are correct to a very small percentage of one per cent.

If you have a second-hand condenser you may use it for ordinary work, but get a standard "Marshall," with which it should be constantly compared.

Condensers are made either with paraffined paper leaves or with thin sheets of mica between the coils, the latter being far superior. Never open your standard condenser. If you have any reason to suspect its trustworthiness return it to the maker.

I have seen a magnificent looking condenser with the maker's name in full, and its capacity engraved on the case to the ten thousandth of a microfarad at a stated temperature.

It was apparently new, but had lain unused for some months, and was, on first trial, proved worthless, the insulation being two ohms. Inspection showed for one fault that the paraffine used was inferior; the acid contained therein had attacked the brass work all over, and when a thin paring was scraped off with a knife the salt of copper from the brass was plainly visible; indeed, in many places it showed green through the paraffine

It was sent back to the maker, who returned it in a week or so with a certificate of its value, but in less than three months it was again useless.

If you have a condenser of this sort, rip out its internal economy and use the case for the extra 100,000 ohm resistance coil described further on, for which it will suit admirably.

Cleanliness, dryness and freedom from dust is of greater consequence in a condenser than in anything else connected with testing. It should, therefore, be left in its wooden case and connected with your testing set permanently, the wires being led through its sides so that it may always be covered up when in use.

The connecting plug or short circuit peg should always be in when not in use, otherwise it will, for reasons not well understood, collect a charge whilst idle. This will, unless expected or foreseen, cause you at times considerable surprise.

The short circuit peg is generally large and heavy, and circular in cross section and has a wonderful capacity for rolling away from where it is laid and dropping into all sorts of un-come-at-able holes and corners, especially those between the condenser and its case. Besides this, there is always a possibility of the plug being forgotten and the condenser left open.

A strip of thin sheet brass may be fastened to the cover of the case by a screw or two in its center, it being just long enough to allow the ends of the spring to rest on the tops of the binding posts when closed. The peg may then be set in a small loop in the cover in case it should be required. By closing the case, the condenser is short circuited and the mere act of raising the lid leaves it ready for use.

Condensers must be treated very carefully and not subjected to blows or concussions, nor to excessive variations of temperature.

Condensers are made generally of one-third and one-half a microfarad capacity. For ordinary work, one-third will be quite large enough, but for higher class work, half or even one microfarad, divided into tenths, or on Marshall's multiple system into hundredths, will be advisable.

The number of cells to be used will, of course, depend on the work you have to do. Ordinary cable work will require from five to 25 cells, or more, according to your working conditions.

Objections have been raised to using shunts to the galvanometer when taking capacity tests, but practically it is perfectly safe to use them; anyhow, you can try by comparing for yourself the value of discharges, with shunts or without.

XIV.

THE CONSTANT.

The constant of the set you are using is generally called the "galvanometer constant," but the galvanometer is but one and the least active factor in producing it.

For instance: The constant may be altered by shifting the scale nearer to, or further from, the galvanometer and when any particular constant is desired it may be obtained approximately by altering the directing magnets and finally reduced to exactitude by a slight shifting of the scale.

Thus, suppose your deflection is 110 and you want 120, you will move the scale from the lamp so as to increase the radius of the ray, and *vice versa*.

Or the constant may be altered by moving the directing magnet towards or from the mirror, so as to "tie it down" or free it. Or, thirdly, which is the most awkward and troublesome way, the constant may be altered by reducing or increasing the battery power.

"The constant" then is only the degree of sensitiveness of the galvanometer as influenced or rather determined by other causes stated above.

It is always best to work with a high constant and also to secure it by other means than a very "free" mirror, and the arrangement described in these articles allows this to be done on account of the great length of radius of the light ray.

Not only does a high constant enable better and more exact work to be done, but it renders the work easier.

For instance: A constant of, say, 100,000, with a ray radius of 24 inches, would require the needle to be almost free or at least tied down by the directing magnet to the smallest possible extent consistent with its keeping its zero.

In this case it would be excessively sensitive to influences perhaps beyond the power of the shield to counteract, and reading would be uncertain. But with a ray radius of six or seven feet the same constant may be easily secured with the needles well tied down to absolute steadiness.

Another important point is that, other things being equal, the higher the constant the slower the deflection and the more easily will it be read. If the needles are tied down by the directing magnets to excess, the deflection of the spot will resemble more a quick flash than a deflection.

The figure of your constant will be determined by the nature of your work. If, for instance, you are measuring an ordinary conductor resistance a very low constant will give you ample sensitiveness, but if you are measuring high insulations, such as short lengths of cable, or comparing the insulating properties of compounds, a very high constant of, say, 500,000 will be none too delicate, on account of the exceedingly small amount of current passing through the galvanometer coils.

The formula for taking the constant is given in most text books, but scarcely ever is it *raisoné* enough for a beginner, so I will try briefly to explain the first principles:

Supposing one cell gives you a deflection of ten divisions through 100,000 ohms, or $\frac{1}{10}$ of a megohm, then ten cells should give you ten times ten, or 100 divisions, and 100 cells should give you ten times that, or 1,000 divisions.

But your scale has a range of only, say, 150 divisions, so you must put in a shunt, say the 10, which should bring back your spot to 100 on the scale. And 200 cells should give you twice that, or 200 divisions. But this is likewise beyond the range of your scale, so you would have to use a shunt of 100 instead of 10, which should bring your spot back to 20 divisions. I have repeatedly said it should. That is, it should, if every one of your 200 cells gave the same current, but it will be found almost invariably that they do not. Therefore, the deflections will not increase in direct proportion to the number of your cells, consequently, it is not correct to take your constant with, say, ten cells, and if you intend to use 200 for your tests, multiply your deflection by 20 for increased battery power. You must split your battery up into as many parts as will suit the range of your galvanometer deflection and take the values of each part, and the total of these will be the total electromotive force, which will not be 20 times as much as the first ten.

But this is a troublesome thing to do and unnecessary in ordinary work. The most practical and certain method of taking a constant is to put in as high a resistance as possible, say the 100,000 ohms, in the resistance box and also the 100,000 ohm coil you were instructed how to make further back, use the 1,000 shunt and the highest battery power you can without driving the spot off the scale, and take your test with this same battery. No error for miscalculation of electromotive force can then arise, and the necessity for calculating it disappears.

Generally, the arrangement of testing room advised will give an absolutely reliable constant of somewhere about 60,000 to 80,000, and this will be found a good steady all-round constant for ordinary work.

It is best and easier to always work with the same constant, and the directing magnets should be altered as little as possible. When an extraordinarily high constant is required, it is best done by adding resistance and increasing battery power, rather than by freeing the galvanometer needles. When once you have got your galvanometer to give a sensitive, slowly deflecting spot, which returns honestly to zero and keeps it steadily, leave it alone or, by altering the directing magnet, you will perhaps upset all you succeeded in accomplishing. It is better for you to become familiar with certain and regular working conditions than to be constantly changing them. You are more likely to detect any irregularities and will be better able to rectify them.

Besides this, it is not at all an easy matter for an inexperienced hand to reproduce a given constant when once the magnetic field has been disturbed. Even old hands prefer always to work with the same constant. As to the degree of delicacy of your suspended needle system, or, in other words, the "height" of your constant, I think it is best determined by the following rule:

Make it as delicate as you possibly can, provided that the spot returns exactly to zero. That it will settle down to zero after a very full deflection is not sufficient.

Shunt your galvanometer, put in all your resistance and try with one or two cells to get a deflection of one single division. This will be a barely perceptible deflection, but, notwithstanding, the spot should return to zero exactly.

If it does you may rely on your deflections being correct. If it does not you must, by advancing the controlling magnet, tie the needles down until it does.

By a steady zero I mean a spot that returns to zero after every deflection by the current only. If you have a high constant and your galvanometer is placed as it should be, so that the needles point north and south, you will, perhaps, during the forenoon perceive the spot creeping up hour after hour a division or so to the right or the left, and in the afternoon moving in the opposite direction.

There is no way of avoiding this diurnal variation, and you will have to shift your scale to meet it. It will not be sufficient to affect your results during the short time required for taking a test, and it may, therefore, be considered as of no importance.

If, when taking your constant, the deflection gradually falls, look to your battery; it is running down. Batteries charged with water only are very liable to this. Let them rest.

If, however, your battery is charged with sal-ammoniac, you may from inadvertence have put down your battery key with all the short circuit pegs left in. Or there may be a fault in the key itself which prevents its properly breaking circuit. A few minutes rest is generally all that is required to restore their power.

If your deflection varies with sudden jerks or behaves in a generally unintelligible manner, look for a leaky jar or a jar over which the sal-ammoniac crystals have been creeping until they reach earth of some kind. Or moisture may have accumulated somewhere about the leads.

A Police Signal System for New York.

On the 29th inst., the police commissioners of New York will listen to all persons and corporations who may desire to submit plans and proposals for furnishing a system of police signaling. At present, if a policeman on post wants any assistance he has to rap with his club on the pavement and wait till help comes, or else do without it. If the commanding officer at the police station wants to communicate with the man on post he is forced to send another man to look for him. The police commissioners have tried for several years to put in a modern electric signal system, but legal obstacles have intervened to prevent.

Another Brush Arc Lamp Suit.

Judge Lacombe last week handed down a final decree in the suit of the Brush Electric Company against the Electric Construction and Supply Company, of New York, perpetually enjoining and restraining defendants from making, using or selling any arc electric lamp in which two or more pairs of carbons are independently regulated and controlled and burned successively.

The Electric Construction and Supply Company is now making the famous Ward double carbon arc lamps under a license from the Brush Electric Company, and all orders will be filled as heretofore.

Two Thousand Volt Street Lamp.

Street lighting by alternate currents has, for some time past, presented considerable difficulties. In most cases transformers are arranged in the houses, and the stations have high pressure leads only. To run incandescent lamps it is, therefore, necessary to employ transformers and a system of low pressure leads. Swinburne & Co., Teddington, Eng., have brought out a lamp which contains a small transformer, and is connected direct to the high pressure system without any low pressure leads. A 32 candle-power lamp, with protector, is arranged under a large enameled iron shade, which is secured to the base case of a small transformer. The efficiency of the transformer is high, considering how small it is, being, according to the makers, just under 90 per cent.

Power Transmission in Utah.

The establishment of an electric power plant at Ogden Cañon, Utah, for supplying Ogden with power for manufacturing purposes, seems now quite probable.

The plant will be planned to convert 1,800 horse-power, but the start will be made with 500 horse-power. At a recent meeting of the committee on solicitation, they reported 400 horse-power subscribed for and contracts for the same signed. The promoters of the enterprise, Messrs. Thompson and Banks, will put in the plant and agree to have it ready for operation by July 1, 1892; in consideration of this, the persons who sign agree to take a specific amount of power for five years at $20 per horse-power per annum.

The scheme is very popular at Ogden and will, no doubt, go through.

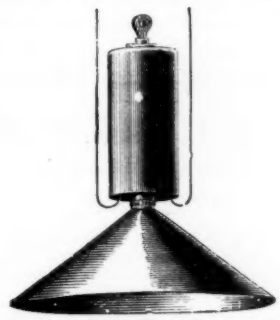
Dynamo Machines.

If there are any apparatus that have particularly exercised the imagination of inventors, they are assuredly lamps, commutators and dynamo machines. These latter, especially, have become very numerous in recent years. It is easy, however, to establish a classification between the different models. Every dynamo comprises two principal parts, viz., the armature and the inductor. The various kinds of continuous current armatures may all be referred to three well known types of winding—the Gramme, the Siemens and the Edison. Besides these there are still other types that we must consider, and, in particular, the Desroziers winding. We shall not dwell upon the details nor upon the advantages and disadvantages of these various armatures, as they have already been presented to our readers.

As for the inductors, the same is not the case. It is but a few years ago that the labors of electricians indicated the conditions that these parts of the dynamo must satisfy. Among such conditions we may mention one in particular. It is necessary to reduce as much as possible the magnetic resistance of the current, or the resistance offered to the flux of force through the iron of the electros, and the air between the iron of the electros and the iron of the ring. The flux of force, as we know, is the product of the intensity of the magnetic field created by the surface embraced. Moreover, it must not be forgotten that a wire surrounding a piece of iron, and being itself traversed by a current, magnetizes such iron and creates in the interior a magnetic field of a certain intensity. If we take the product of such intensity by the surface of the piece of iron, we obtain the flux of force, the consideration of which is a most important matter in the construction of dynamos. These few remarks suffice to show that, in a good dynamo, the flux of force should have a maximum value. It is well, then, for a given number of windings of wire, to be careful as to the nature of the metal of the inductors, to employ iron of very great magnetic permeability, and to reduce as much as possible the resistance of the air necessarily interposed between the inductor poles and the armature. This latter condition imposes the obligation of placing the inductors as near as possible to the armature, leaving just the space necessary for the motion of the armature, and afterward of making the latter embrace the widest surface possible.

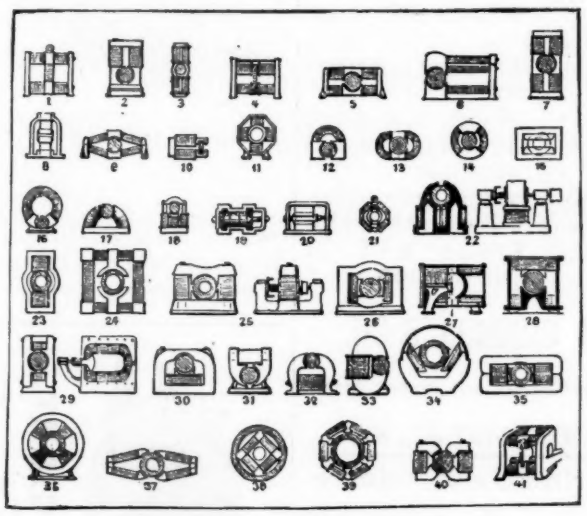
The second part of a dynamo machine, the inductor, gives rise, as may be seen, to more numerous inventions than the armature. In fact, there has been no want of models. One of our most learned electricians has conceived the happy and original idea of bringing together, in one plate, the various types of inductors of continuous current machines, which we reproduce in the accompanying engraving.

No. 1 represents the well known Gramme machine, No. 2 the Edison-Hopkinson, and No. 3 shows us the arrangement of the Siemens dynamo, with drum armature and horizontal inductors. This machine bears also the name of Hefner Alteneck, the engineer-in-chief of the Siemens establishment. In No. 4 we find the Schuckert type, with disk armature, and in No. 5 the form of the Weston machines, with drum armature, of the Burgin ring machines, and of the Crompton, Paterson and Cooper machines. No. 6 shows the large Edison machine of 1880, which was adopted by all the American central stations and by the Milan station. No. 7 represents a third type of the Edison dynamo of four or five bobbins. To this type is referred the English machine Phœnix. No. 8 gives the aspect of one of the first types of the Gramme machine. Messrs.



SWINBURNE'S 2,000 VOLT STREET LAMP.

Burgin & Crompton devised a dynamo, which is represented in No. 9, but which is now abandoned. In this we find the first principles of the Meritens and Jackson machines. Fig. 10 gives a diagram of the Kummer & Company machine, which is similar to the Jones dynamo and the Gramme motor. In No. 11 is found represented one of the first models of the Gramme machine with several poles—a model which has since been constructed with more or less modification by the Oerlikon and Allgemeine Gesellschaft Companies, of Berlin. In all these machines we find a large external polygonal ring, to which, according to the radii, are adapted iron arms which, in the center, leave between them an annular space, in which the bobbin revolves. No. 12 shows a motor devised by Silvanus Thompson. No. 13 is a modification of the inductors of the dynamo No. 9, proposed by Mr. Kapp



DYNAMO MACHINES.

for the reduction of the magnetic resistance of the circuit. No. 14 is a section of the well known Griscom motor. No. 15 is a new form of motor for electric railways, constructed by the Thomson-Houston Company. In No. 16 is figured a section of the Eddy & Mather American machine. No. 17 shows a Furgersen dynamo. No. 18 shows one of the commonest forms of the Goolden & Trotter dynamos. The dynamo of the Telephone Company of Zurich is represented in No. 19, the Guzzi-Ravizza and Ironsides in No. 20, and the Tyne dynamo, of Scott & Moutain, in No. 21. No. 22 gives a section and profile of a superior type of Gramme dynamo, devised by Kapp, and since imitated by a number of manufacturers. No. 23 represents the Hochhausen dynamo, No. 24 the Elwell, Parker & Crompton dynamos, and No. 25 the Manchester type, due to Hopkinson. It is to this latter type that belong the Brown of Oerlikon, Mather & Platt, Sautter & Lemonnier, Tighe, Joel, Clark-Muirhead, Blakey, Emmot & Immisch and Sprague machines. Nos. 26, 27, 28, 29, 30 and 31, show, respectively, the Lahmeyer, Thomson-Houston, Wenstrom, Eickemeyer, Continental and Mordey & Jones machines. No. 33 represents a form common to several American motors, notably to the Patten and United States and Jenney motors. Silvanus Thompson devised the dynamo shown in No. 33, and Mr. Fein the dynamo shown in No. 34. No. 35 gives the form of Kennedy's iron-clad dynamo machine. Finally, the Alioth Helvetia, Elwell, Siemens (with interior poles), Thury, Kester, Brush or Schuckert-Mordey or Victoria dynamo machines are represented in Nos. 36, 37, 38, 39, 40 and 41. This enumeration comprises but a few of the principal types of continuous current machines, now no longer new. Doubtless, among all these dynamos, there are several that are superior to the rest, but still, the same qualities are sometimes reached by various means and different forms, and it is often difficult to fix one's choice between several models. The question of cost alone intervenes. The short history that precedes shows the path that the dynamo machine has traveled since its invention, and it proves that the mind of inventors has not remained inactive.—*La Nature.*

Heating by Electricity.

Mr. F. S. Pierson, chief engineer of the electrical department of the West End Street Railway Company, of Boston, in a recent interview, published in the Boston *Journal*, makes some quite interesting statements and prophecies regarding heating by electricity.

The West End Company are now making an experiment of heating cars by this agency and have introduced it into 20 cars. Mr. Pierson states, however, that it costs about five times as much as heating by stoves, though, of course, it may have other advantages which would make it preferable for car heating.

Mr. Pierson has not the slightest doubt but that in a very short time many houses will be heated in this manner, and states that there are two apartment houses in St. Louis making the test.

Quoting from his interview, he says:

"The great objection to it is the cost, and it will be many years before any but wealthy families can adopt it, simply because it costs much more than coal or steam. I believe the time to be not far distant when electricity will take the place of coal even, but of course that will come when the producer manages to manufacture at less cost, thus decreasing the expense to the consumer. There must be a great reduction in the cost of producing electricity before it can be applied to many more practical purposes.

"That work is now going on, and the electric light companies throughout the country are putting in large engines and generators, which will serve to reduce the cost. It now costs the West End double what it will cost when we get one large power station and do away with the temporary plant. The Edison Company is now building a central station on Atlantic avenue, and thus it can readily be seen the cost to the consumer of electricity is steadily decreasing.

"Before long we will not only have our houses heated, but with the same wire which serves to heat we will be able to cook our meals and light our houses. Then we could light our fires, and each would be a great improvement over the present system, because there would then be less dirt and trouble. An electric heater could be stationed in one corner of a room, in an iron box, and would give no more bother than a steam radiator. The heat could easily be regulated by a switch to any degree wanted, and the heat would be pure and free from gas. From a recent experiment it has been shown that 50 per cent. of the electricity generated at the water wheel can be transmitted 119 miles.

"With this in view, I ask, why can't some of the water falls in New England be brought into service and do away with the present system? It can be done, and just as soon as it is the cost of producing will be greatly cheapened. New York State has granted to a company a charter for the utilizing of Niagara Falls for electrical purposes. These mighty falls can give 100,000 horse-power."

The Buckeye Engine Company, of Salem, O., report that they enjoyed an unusually prosperous year during 1891, and that the prospects for 1892 are unusually flattering.

Mr. A. J. Van Nuis, Electrical Exchange, New York, reports that the demand for the famous Ajax switches keeps up to the mark. Mr. Van Nuis has been behind in his orders for some time, but has now about caught up.

Ball Engines.—The Attica Electric Company, Attica, N. Y., a new company recently established at that place, has purchased one 80 horse-power and one 50 horse-power Ball engine, built by the Ball Engine Company, Erie, Pa.

The Joseph Dixon Crucible Company, of Jersey City, N. J. are issuing a complete illustrated catalogue of all their graphite productions. It is surprising how many uses this substance is put to. The pamphlet is very neatly arranged.

The Fort Wayne Electric Company and the Falls Rivet and Machine Company have just received large orders for Australia, the former for an electric light plant and the latter for friction clutches, pulleys, shafting, etc. The total contracts amount to $25,000.

The Electric Merchandise Company, of Chicago, continues busy, even in the slow season, with orders from its various patrons throughout the country. It is now making an increase in its stock of goods which will enable it to hold the reputation it has already made for prompt and accurate shipments. The past week the company filled an order for 3,000 pounds of Electric Merchandise Company's black tape. The frequency of similar large orders speaks well for the goods manufactured and sold by this company.

The Elektron Manufacturing Company, Springfield, Mass., have recently received the following interesting letter:

OFFICE OF "THE NEW ERA."
(Daily and Weekly.)
Lancaster, Pa., January 1, 1892.

MR. E. H. CUTLER, MANAGER THE ELEKTRON MANUFACTURING COMPANY,

Dear sir: One year ago we substituted electrical for steam power in *The New Era* Printing House. A 20 horse-power Perret motor furnishes power for the machinery in the main press room, driving a Goss perfecting newspaper press, with double feeder, an Adams and three cylinder book presses, freight elevator and the machinery in stereotype foundry.

A 10 horse-power Perret furnishes power for the half dozen presses and other machinery in the jobbing department, with ample reserve power for increase of both plants. The performance of these motors has been satisfactory in all respects. They run free from sparking, maintain a uniform speed under all variations of load, and cost nothing for engineering. We would not exchange for steam power upon any consideration. They are always ready for duty at any hour of the day or night without waiting to "get up steam." Steam for drying matrices is furnished by Murray's generator and steam table combined, which is both economical and convenient. As you are aware, we selected the Perret motor from a number of competitors, because, while equal to the best in points in common, it was the only one which developed its maximum power at such slow speed as enabled us to run our line shafts without the intervention of countershafting.

The experience of a year fully confirms our judgment in the selection of these machines. Yours, very truly,

WARFEL & GEIST.

(Copy.)

WILLIAM D. TYNDALL,
ATTORNEY AND COUNSELLOR AT LAW,
No. 170 Broadway, N. Y.

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Planers, 16 in. x 16 in. x 3 ft.; 20 in. x 20 in. x 4 ft.; 24 in. x 24 in. x 6 ft.; 30 in. x 30 in. x 6 ft.; 36 in. x 36 in. x 10 ft.; 42 in. x 42 in. x 12 ft.; 72 in. x 60 in. x 12 ft.; 72 in. x 60 in. x 20 ft.

Friction Shapers, 15 in., 18 in., 20 in., 22 in., 32 in.

Crank Shapers, 6 in., 8 in., 10 in., 12 in., 18 in., 16 in., 20 in., 24 in., 28 in.

Screw Machines, Nos. 1, 2, 3, 4, with or without Wire Feed.

Screw Machines, Nos. 5, 6, 7, 8, Power Feed.

Presses, Nos. 51, 52, 53, Ferracute, Nos. 1, 2, , Stiles & Parker.

5 Lincoln Pattern Millers, No. 2.

Hand Millers, Nos. 1 and 2. 3 Cam Cutters.

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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON JANUARY 5, 1892.

466,562 Incandescent lamp; Perrin Grant, Portsmouth, Va.

466,576 Globe guard for electric lights; Charles P. Robbins, Calais, Me.

466,604 Electrical signal box; Thomas F. Gaynor, Louisville, Ky., assignor to the Gaynor Electric Co., same place.

466,620 Multiple signal transmitter; Charles E. Nash, Newton, Mass.

466,644 Electric push; John F. Wollensak, Chicago, Ill.

466,664 Electric battery; Patrick B. Delany, South Orange, N. J.

466,686 Electric meter; Charles K. Huguet, New Orleans, La.

466,702 Multiple switchboard busy test circuit and apparatus; Frank A. Pickernell, Newark, N. J.

466,720 Process of obtaining insoluble chlorides by electrolysis; Stanley C. C. Currie, Philadelphia, Pa., assignor to the United Gas Improvement Co., same place.

466,725 Magneto-telephone for personal wear; Alonzo E. Nultimore, Catskill, N. Y., assignor, by direct and mesne assignments, of one-half to Geo. G. Schroeder and Frank Palmer, Washington, D. C.

466,726 Insulator; George B. Norgrave, Philadelphia, Pa., assignor to Richard I. Brewster, New York, N. Y.

466,760 Regulation of dynamo-electric machines; Rene Thury, Geneva, Switzerland, assignor to Cuenod, Sauter & Co., same place.

466,761 Safety fuse for electric conductors; James A. Wotton, Atlanta, Ga., assignor of one-half to John D. Easterlin, same place.

JANUARY 12, 1892.

466,781 Electric steam engine governor; Frank M. Garland, New Haven, Conn.

466,784 Electrical annunciator; William F. Harte, Omaha, Neb., assignor to the Automatic Call Manufacturing Co., same place.

466,787 Electric indicator; Charles W. Holtzer and George E. Cabot, Brookline, assignors to the Holtzer-Cabot Electric Co., Boston, Mass.

466,798 Electric battery; John S. Nowatny, Cincinnati, O., assignor of one-fourth to William H. Robinson, Covington, Ky.

466,800 Wire support for electric railways; Wm. Q. Prewitt, Lexington, Ky.

466,802 Electric switch; Edwin W. Rice, Jr., Lynn, Mass., assignor to the Thomson-Houston Electric Co. of Connecticut.

466,807 Electric trolley; Elmer A. Sperry, Chicago, Ill.

466,820 Battery zinc and method of making the same; John Beattie, Jr., Fall River, Mass.

466,825 Method of electric welding; Peter Gendron, Toledo, O., assignor to the Gendron Iron Wheel Co., same place.

466,832 Electric motor car; Elbert B. Phillips, Cleveland, O.

466,856 Electric fuse or detonator; Paul Ward and Edward M. Gregory, London, England.

466,858 Printing telegraph; John E. Wright, New York, N. Y., assignor, by mesne assignments, to the American Type Telegraph of New Jersey.

466,865 Automatic electric heat alarm; Morrill S. Pierce, Westport, Leonard H. Desisle, Lamoine, and Orville C. Oliver, Eden, assignors to the Electric Heat Alarm Co., Bangor, Me.

466,870 Annunciator; David Heineman, Wabash, Ind.

466,914 Railway electric motor; Chas. F. Winkler, Troy, N. Y.

466,924 Attachment for phonographs; John F. Ott, Orange, assignor to Thomas A. Edison, Llewellyn Park, N. J.

466,937 Electric converter; Gustav Pfannkuche, Cleveland, O., assignor to the Brush Electric Co., same place.

466,953 Ammeter; Charles F. Brush, Cleveland, Ohio.

466,956 Bracket for trolley wire supports, etc.; Edward P. Russell, Newburyport, Mass.

466,972 Brush holder for commutators for dynamo-electric machines; Isaac H. Bartholomew, Northford, Conn.

466,973 Electric elevator; William Baxter, Jr., Baltimore, Md., assignor to the Baxter Electric Motor Co., same place.

466,981 Trolley for electric railways; John Kuehnle, Detroit, Mich., assignor of three-tenths to Edward Martyn, same place.

JOHN A. BARRETT,
ELECTRICAL ENGINEER & EXPERT,
13 PARK ROW,
Room 28. NEW YORK.

INSULATION.

I am in search of a good insulation for electric wires. Persons having either a patent compound or a private formula may address as below with date and number of patent, all necessary information, samples of both wire and compounds, if possible; records of tests, etc. All information will be treated in strict confidence.

A. B. VOLT,
Care of ELECTRICAL REVIEW,
13 PARK ROW, N. Y.